2020 RNA Appendices

A Report by the
New York Independent
System Operator

DRAFT
For October 28, 2020 MC

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Appendix A - 2020 Reliability Needs Assessment Glossary

Annual Transmission Reliability Assessment (ATRA): An assessment, conducted by the NYISO staff in cooperation with Market Participants, to determine the System Upgrade Facilities required for each generation project and Class Year Transmission Project included in this Assessment to interconnect to the New York State Transmission System in compliance with Applicable Reliability Standards and the NYISO Minimum Interconnection Standard. *(Source: Attachment S of OATT)*

Area Transmission Review (ATR): The NYISO, in its role as Planning Coordinator, is responsible for providing an annual report to the NPCC Compliance Committee in regard to its Area Transmission Review in accordance with the NPCC Reliability Compliance and Enforcement Program and in conformance with the NPCC Design and Operation of the Bulk Power System. *(Source: NPCC Directory #1)*

Baseline Forecast: The baseline forecasts from the NYISO's Gold Book report the expected NYCA load, and include the projected impacts of energy efficiency programs, building codes and standards, distributed energy resources, behind-the-meter energy storage, behind-the-meter solar photovoltaic power (solar PV), electric vehicle usage, and electrification of heating and other end uses. The baseline forecasts are used in the RNA Base Cases for determining Bulk Power Transmission Facilities Reliability Needs for the RNA Study Period. *(Source: 2020 Gold Book)*

Best Technology Available (BTA): NYS DEC policy establishing performance goals for new and existing electricity generating plants for Cooling Water Intake Structures. The policy applies to plants with design intake capacity greater than 20 million gallons/day and prescribes reductions in fish mortality. The performance goals call for the use of wet, closed-cycle cooling systems at existing generating plants. *(Source: Section 316(b), Clean Water Act, United States Environmental Protection Agency)*

New York State Bulk Power Transmission Facility (BPTF): The facilities identified as the New York State Bulk Power Transmission Facilities in the annual Area Transmission Review submitted to NPCC by the ISO pursuant to NPCC requirements. *(Source: Attachment Y of OATT definitions)*

CARIS: The Congestion Assessment and Resource Integration Study for economic planning developed by the ISO in consultation with the Market Participants and other interested parties pursuant to Section 31.3 of this Attachment Y. (*Source: NYISO OATT*)

Clean Energy Standard (CES): State initiative for 70% of electricity consumed in New York State to be produced from renewable sources by 2030.

Climate Leadership and Community Protection Act (CLCPA): State statute enacted in 2019 to address and mitigate the effects of climate change. Among other requirements, the law mandates that; (i) 70% of energy consumed in New York State be sourced from renewable resources by 2030, (ii) greenhouse gas emissions must be reduced by 40% by 2030, (iii) the electric generation sector must be zero greenhouse gas emissions by 2040, and (iv) greenhouse gas emissions across all sectors of the economy must be reduced by 85% by 2050. (*Source: 2019 CARIS Phase I*)

Contingencies: An actual or potential unexpected failure or outage of a system component, such as a generator, transmission line, circuit breaker, switch, or other electrical element. A contingency also may include multiple components, which are related by situations leading to simultaneous component outages. *(Source: NYSRC Reliability Rules)*

Dependable Maximum Net Capability (DMNC): The sustained maximum net output of a Generator, as demonstrated by the performance of a test or through actual operation, averaged over a continuous time period as defined in the ISO Procedures. *(Source: OATT Definitions)*

Electric System Planning Work Group (ESPWG): The Electric System Planning Work Group, or any successor work group or committee designated to fulfill the functions assigned to the ESPWG in this tariff. *(Source: Attachment S of OATT)*

Emergency Transfer Criteria: It is intended that the NYS Bulk Power System be operated within Normal Transfer Criteria at all times insofar as possible. However, in the event that adequate facilities are not available to supply firm load within Normal Transfer Criteria, emergency transfer criteria may be invoked. Under emergency transfer criteria, transfers may be increased up to, but not exceed, emergency ratings and limits as follows:

a. Pre-contingency line and equipment loadings may be operated up to LTE ratings for up to four (4) hours, provided the STE ratings are set appropriately. Otherwise, pre-contingency line and equipment loadings must be within normal ratings. Pre-contingency voltages and transmission interface flows must be within applicable pre-contingency voltage and stability limits.

b. Post-contingency line and equipment loadings within STE ratings. Post-contingency voltages and transmission interface flows within applicable post-contingency voltage and stability limits. *(Source: NYSRC Reliability Rules)*

Fault: An electrical short circuit. *(Source: NYSRC Reliability Rules)*

Federal Energy Regulatory Commission (FERC): The Federal Energy Regulatory Agency within the U.S. Department of Energy that approves the NYISO's tariffs and regulates its operation of the bulk electricity grid, wholesale power markets, and planning and interconnection processes.

FERC Form 715: An annual report that is required by transmitting utilities operating grid facilities that are rated at or above 100 kV. The report consists of transmission systems maps, a detailed description of transmission planning Reliability Criteria, detailed descriptions of transmission planning assessment practices, and detailed evaluation of anticipated system performance as measured against Reliability Criteria.

Forced Outage: An unscheduled inability of a Market Participant's Generator to produce Energy that does not meet the notification criteria to be classified as a scheduled outage or de-rate as established in ISO Procedures. If the Forced Outage of a Generator starts on or after May 1, 2015, the Forced Outage will expire at the end of the month which contains the 180th day of its Forced Outage but may be extended if the Market Participant has Commenced Repair of its Generator. *(Source: Market Services Tariff-MST-Definitions)*

Gold Book: Annual NYISO publication of its Load and Capacity Data Report.

Installed Capacity (ICAP): External or Internal Capacity, in increments of 100 kW that is made available pursuant to Tariff requirements and ISO Procedures *(Source: NYISO's MST Definitions).*

Installed Capacity Requirement (ICR): The annual statewide requirement established by the NYSRC in order to ensure resource adequacy in the NYCA. *(Source: NYSRC Reliability Rules)*

Installed Reserve Margin (IRM): The amount of installed electric generation capacity above 100% of the forecasted peak electric demand that is required to meet NYSRC resource adequacy criteria. Most studies in recent years have indicated a need for a 15-20% reserve margin for adequate reliability in New York.

Local Transmission Plan (LTP): The Local Transmission Owner Plan, developed by each Transmission Owner, which describes its respective plans that may be under consideration or finalized for its own Transmission District. *(Source: Attachment Y of OATT)*

Local Transmission Planning Process (LTPP): The Local Planning Process conducted by each Transmission Owner for its own Transmission District. *(Source: Attachment Y of OATT)*

Loss of Load Expectation (LOLE): The probability (or risk) of disconnecting any firm load due to resource deficiencies shall be, on average, not more than once in ten years. Compliance with this criterion shall be evaluated probabilistically, such that the loss of load expectation (LOLE) of disconnecting firm load due to resource deficiencies shall be, on average, no more than 0.1 day per year. This evaluation shall make due allowance for demand uncertainty, scheduled outages and deratings, forced outages and deratings, assistance over interconnections with neighboring control areas, NYS Transmission System emergency transfer capability, and capacity and/or load relief from available operating procedures. *(Source: NYSRC Reliability Rules)*

Market Monitoring Unit: "Market Monitoring Unit" shall mean the consulting or other professional services firm, or other similar entity, retained by the Board, as specified in Section 30.4.2 of Attachment O, that is responsible for carrying out the Core Market Monitoring Functions and the other functions that are assigned to it in Attachment O. The Market Monitoring Unit shall recommend Tariff and market rule changes, but shall not participate in the administration of the ISO's Tariffs, except as specifically authorized in Attachment O. *(Source: Attachment O of MST)*

Market Participant: An entity, excluding the ISO, that produces, transmits, sells, and/or purchase for resale Unforced Capacity, Energy or Ancillary Services in the Wholesale Market. Market Participants include: Transmission Customers under the ISO OATT, Customers under the ISO Services Tariff, Power Exchanges, Transmission Owners, Primary Holders, LSEs, Suppliers and their designated agents. Market Participants also include entities buying or selling TCCs. *(Source: MST Definitions)*

New York Control Area (NYCA): New York Control Area (NYCA): The Control Area that is under the control of the ISO which includes transmission facilities listed in the ISO/TO Agreement Appendices A-1 and A-2, as amended from time-to-time, and generation located outside the NYS Power System that is subject to protocols (*e.g.,* telemetry signal biasing) which allow the ISO and other Control Area operator(s) to treat some or all of that generation as though it were part of the NYS Power System. *(Source: MST Definitions)*

New York State Department of Environmental Conservation (NYSDEC): The agency that implements the New York State Environmental Conservation Law, with some programs also governed by federal law.

New York Independent System Operator (NYISO): Formed in 1997 and commencing operations in 1999, the NYISO is a not-for-profit organization that manages New York's bulk electricity grid — an over 11,000-mile network of high voltage lines that carry electricity throughout the state. The NYISO also oversees the state's wholesale electricity markets. The organization is governed by an independent Board of Directors and a governance structure made up of committees with Market Participants and stakeholders as members.

New York State Department of Public Service (NYDPS): As defined in the New York Public Service Law, it serves as the staff for the New York State Public Service Commission.

New York State Energy Research and Development Authority (NYSERDA): A corporation created under the New York State Public Authorities law and funded by the System Benefits Charge (SBC) and other sources. Among other responsibilities, NYSERDA is charged with conducting a multifaceted energy and environmental research and development program to meet New York State's diverse economic needs, and administering state System Benefits Charge, Renewable Portfolio Standard, energy efficiency programs, the Clean Energy Fund, and the NY-Sun Initiative.

New York State Public Service Commission (NYPSC): The New York State Public Service Commission is the decision making body of the New York State Department of Public Service. The PSC regulates the state's electric, gas, steam, telecommunications, and water utilities and oversees the cable industry. The Commission has the responsibility for setting rates and ensuring that safe and adequate service is provided by New York's utilities. In addition, the Commission exercises jurisdiction over the siting of major gas and electric transmission facilities.

NY-Sun Initiative: A program initiated by Governor Cuomo in 2012 and administered by NYSERDA for the purpose of obtaining more than 6,000 MW-DC of behind-the-meter solar PV by the end of 2023.

New York State Reliability Council (NYSRC): An organization established by agreement among the Member Systems of the New York Power Pool (the "NYSRC Agreement"). *(Source: OATT Definitions)*

Normal Transfer Criteria*:* Under normal transfer criteria, adequate facilities are available to supply firm load with the bulk power transmission system within applicable normal ratings and limits as follows:

a. Pre-contingency line and equipment loadings within normal *rating*s. Pre-contingency voltages and transmission *interface* flows within applicable pre-contingency voltage and *stability limit*s.

b. Post-contingency line and equipment loadings within applicable *emergency* (LTE or STE) *rating*s. Post-contingency voltages and transmission *interface* flows within applicable post-contingency voltage and *stability limit*s.

All contingencies listed in Table B2 "NYSRC Planning Design Criteria: Contingency Event, "in the reliability rules apply under normal transfer criteria. *(Source: NYSRC Reliability Rules)*

Normal Transfer Limit: The maximum allowable transfer is calculated based on thermal, voltage, and stability testing, considering contingencies, ratings, and limits specified for normal conditions. The normal transfer limit is the lowest limit based on the most restrictive of these three maximum allowable transfers. *(Source: NYSRC Reliability Rules)*

North American Electric Reliability Corporation (NERC): The North American Electric Reliability Council or, as applicable, the North American Electric Reliability Corporation. *(Source: OATT Definitions)*

Northeast Power Coordinating Council (NPCC): The Northeast Power Coordinating Council, or any successor organization. *(Source: Attachment Y of OATT)*

Open Access Transmission Tariff (OATT): Document of Rates, Terms and Conditions, regulated by the FERC, under which the NYISO provides transmission service. The OATT is a dynamic document to which revisions are made on a collaborative basis by the NYISO, New York's Electricity Market Stakeholders, and the FERC.

Order 890: Adopted by FERC in February 2007, Order 890 is a change to FERC's 1996 transmission open access regulations (established in Orders 888 and 889). Order 890 is intended to provide for more effective competition, transparency and planning in wholesale electricity markets and transmission grid operations, as well as to strengthen the Open Access Transmission Tariff (OATT) with regard to non-discriminatory transmission service. Order 890 requires Transmission Providers — including the NYISO — to have a formal planning process that provides for a coordinated transmission planning process, including reliability and economic planning studies.

Order 1000: The Final Rule entitled Transmission Planning and Cost Allocation by Transmission Owning and Operating Public Utilities, issued by the Commission on July 21, 2011, in Docket RM10-23-001, as modified on rehearing, or upon appeal. (See FERC Stats & Regs. ¶ 31,323 (2011) (Order No. 1000), on reh'g and clarification, 139 FERC ¶ 61,132 (Order No. 1000-A), on reh'g and clarification, 141 FERC ¶ 61,044 (2012) (Order No. 1000- B). *(Source: Attachment Y of OATT)*

Outage: The forced or scheduled removal of generating capacity or a transmission line from service.

Peak Demand: The maximum instantaneous power demand, measured in megawatts (MW), and also known as peak load, is usually measured and averaged over an hourly interval.

Queue Position: Queue position shall mean the order of a valid Interconnection Request, Study Request, or Transmission Interconnection Application relative to all other pending Requests, that is established based upon the date and time of receipt of the valid Interconnection Request by NYISO, unless specifically provided otherwise in an applicable transition rule set forth in Attachment P, Attachment X or Attachment Z to the ISO OATT. *(Source: Attachment X of OATT)*

Rating: The operational limits of an electric system, facility, or element under a set of specified conditions.

i. *Normal Rating*: The capacity rating of a transmission facility that may be carried through consecutive twenty- four (24) hour load cycles.

ii. *Long Time Emergency (LTE) Rating:* The capacity rating of a transmission facility that can be carried through infrequent, non- consecutive four (4) hour periods.

iii. *Short Time Emergency (STE) Rating*: The capacity rating of a transmission facility that may be carried during very infrequent contingencies of fifteen (15) minutes or less duration. *(Source: NYSRC Reliability Rules)*

Reasonably Available Control Technology for Oxides of

Nitrogen (NOx RACT): Regulations promulgated by NYSDEC for the control of emissions of nitrogen oxides (NOx) from fossil fuel-fired power plants. The regulations establish presumptive emission limits for each type of fossil fueled generator and fuel used in an electric generator in NY. The NOx RACT limits are part of the State Implementation Plan for achieving compliance with the National Ambient Air Quality Standard (NAAQS) for ozone. *(Source: 6 NYCRR Part 227-2)*

Reactive Power Resources: Facilities such as generators, high voltage transmission lines, synchronous condensers, capacitor banks, and static VAr compensators that provide reactive power. Reactive power is the portion of electric power that establishes and sustains the electric and magnetic fields of alternating-current equipment. Reactive power is usually expressed as kilovolt-amperes reactive (kVAr) or megavolt-ampere reactive (MVAr).

Regional Greenhouse Gas Initiative (RGGI): A cooperative effort by a group of Northeast and Mid-Atlantic states to limit power sector greenhouse gas emissions using a market-based cap-and-trade approach. *(Source: https://www.rggi.org/)*

Reliability: The degree of performance of the bulk electric system that results in electricity being delivered to customers within accepted standards and in the amount desired. Reliability may be measured by the frequency, duration, and magnitude of adverse effects on the electric supply. Electric system reliability can be addressed by considering two basic and functional aspects of the electric system — adequacy and security.

i. *Adequacy:* The ability of the electric systems to supply the aggregate electrical demand and energy requirements of their customers at all times, taking into account scheduled and reasonably expected unscheduled outages of system elements. Note: Adequacy encompasses both generation and transmission.

ii. *Security:* The ability of the electric system to withstand disturbances such as electric short circuits or unanticipated loss of system elements. The ability of the power system to withstand the loss of one or more elements without involuntarily disconnecting firm load. *(Source: NYSRC Reliability Rules)*

Reliability Criteria: The electric power system planning and operating policies, standards, criteria, guidelines, procedures, and rules promulgated by the North American Electric Reliability Corporation (NERC), Northeast Power Coordinating Council (NPCC), and the New York State Reliability Council (NYSRC), as they may be amended from time to time. *(Source: Attachment Y of OATT definition)*

Reliability Need: A condition identified by the ISO as a violation or potential violation of one or more Reliability Criteria. *(Source: Attachment Y of OATT definition)*

Reliability Needs Assessment (RNA): The Reliability Needs Assessment as approved by the ISO Board under this Attachment. *(Source: Attachment Y of OATT definition)*

Reliability Planning Process (RPP): The process set forth in this Attachment Y by which the ISO determines in the RNA whether any Reliability Need(s) on the BPTFs will arise in the Study Period and addresses any identified Reliability Need(s) in the CRP, as the process is further described in Section 31.1.2.2. (Source: Attachment Y of OATT)

Reliability Solutions:

i. *Alternative Regulated Solutions (ARS)*: Regulated solutions submitted by a TO or other developer in response to a solicitation for solutions to a Reliability Need identified in an RNA.

ii. *Gap Solution:* A solution to a Reliability Need that is designed to be temporary and to strive to be compatible with permanent market-based proposals. A permanent regulated solution, if appropriate, may proceed in parallel with a Gap Solution. Note: The NYISO may call for a Gap Solution to an imminent threat to reliability of the Bulk Power Transmission Facilities if no market-based solutions, regulated backstop solutions, or alternative regulated solutions can meet the Reliability Needs in a timely manner.

iii. *Market-Based Solutions:* Investor-proposed projects that are driven by market needs to meet future reliability requirements of the bulk electricity grid as outlined in the RNA. Those solutions can include generation, transmission and demand response Programs.

iv. *Regulated Backstop Solutions*: Proposals required of certain TOs to meet Reliability Needs as outlined in the RNA. Those solutions can include generation, transmission or demand response. Non-Transmission Owner developers may also submit regulated solutions. *(Source: Attachment Y of OATT)*

Responsible Transmission Owner (Responsible TO): The Transmission Owner or Transmission Owners designated by the ISO, pursuant to Section 31.2.4.3, to prepare a proposal for a regulated backstop solution to a Reliability Need or to proceed with a regulated solution to a Reliability Need. The Responsible Transmission Owner will normally be the Transmission Owner in whose Transmission District the ISO identifies a Reliability Need and/or that owns a transmission facility on which a Reliability Need arises. *(Source: Attachment Y of OATT definitions)*

RNA Study Period: The seven-year time period encompassing years 4 through 10 following the year in which the RNA is conducted, which is used in the RNA and the CRP. For example, the 2020 RNA covers the 7-year Study Period of 2024 through 2030. *(Source: Attachment Y of OATT definitions with STAR).*

Short-Term Assessment of Reliability (STAR): The ISO's assessment, in coordination with the Responsible Transmission Owner(s), of whether a Short-Term Reliability Process Need will result from a Generator becoming Retired, entering into a Mothball Outage, a Generator being unavailable due to an ICAP Ineligible Forced Outage, or from other changes to the availability of Resources or to the New York State Transmission System. The ISO performs STARs on a quarterly basis, commencing on the dates specified in ISO Procedures.

Short-Term Reliability Process: The process set forth in this Attachment FF by which the ISO evaluates and addresses the reliability impacts resulting from both: (i) Generator Deactivation Reliability Need(s), and/or (ii) other Reliability Needs on or affecting the BPTFs that are identified in a STAR. The Short-Term Reliability Process evaluates reliability needs in years one through five of the ten-year Study Period, with a focus on needs in years one through three.

Short-Term Reliability Process Need: A Generator Deactivation Reliability Need or a condition identified by the ISO in a STAR as a violation or potential violation of one or more Reliability Criteria on the BPTF.

Short-Term Reliability Process Solution: A solution to address a Short-Term Reliability Process Need, which may include (i) an Initiating Generator, (ii) a solution proposed pursuant to Section 38.4, or (iii) a Generator identified by the ISO pursuant to Section 38.5.

Short-Term Assessment of Reliability Start Date: The date on which the ISO next commences a STAR after the ISO issues a written notice to a Market Participant pursuant to Section 38.3.1.4 indicating that the Generator Deactivation Notice for its Generator is complete. If a Market Participant's Generator enters into an ICAP Ineligible Forced Outage pursuant to Section 5.18.2.1 of the ISO Services Tariff, then the Short-Term Assessment of Reliability Start Date is the date on which the ISO next commences a STAR; except (i) when the ISO determines that it should commence a stand alone Generator Deactivation Assessment based on the potential for an immediate reliability need to arise (see Section 38.3.4), or (ii) when the ISO is able to and elects to add a Generator that is in an ICAP Ineligible Forced Outage to a STAR that has already begun. Under either exception [(i) or (ii)], the Short-Term Assessment of Reliability Start Date is the date on which the Generator entered an ICAP Ineligible Forced Outage. *(Source: Attachment Y, Section 38.1)*

Special Case Resource ("SCR"): Demand Side Resources whose Load is capable of being interrupted upon demand at the direction of the ISO, and/or Demand Side Resources that have a Local Generator, which is not visible to the ISO's Market Information System and is rated 100 kW or higher, that can be operated to reduce Load from the NYS Transmission System or the distribution system at the direction of the ISO. Special Case Resources are subject to special rules, set forth in Section 5.12.11.1 of this ISO Services Tariff and related ISO Procedures, in order to facilitate their participation in the Installed Capacity market as Installed Capacity Suppliers. (Source: NYISO MST Tariff Definitions)

System Benefits Charge (SBC): An amount of money, charged to ratepayers on their electric bills, which is administered and allocated by NYSERDA towards energy-efficiency programs, research and development initiatives, low-income energy programs, and environmental disclosure activities.

Transfer Capability: The measure of the ability of interconnected electrical systems to reliably move or transfer power from one area to another over all transmission facilities (or paths) between those areas under specified system conditions.

Transmission Constraints: Limitations on the ability of a transmission system to transfer electricity during normal or emergency system conditions.

Transmission Owner (TO): A public utility or authority that owns transmission facilities and provides Transmission Service under the NYISO's tariffs

Unforced Capacity: The measure by which Installed Capacity Suppliers will be rated, in accordance with formulae set forth in the ISO Procedures, to quantify the extent of their contribution to satisfy the NYCA Installed Capacity Requirement, and which will be used to measure the portion of that NYCA Installed Capacity Requirement for which each LSE is responsible (*Source: Market Services Tariff (MST) Definitions).*

Unforced Capacity Deliverability Rights: Unforced Capacity Deliverability Rights (UDRs) are rights, as measured in MWs, associated with (i) new incremental controllable transmission projects, and (ii) new projects to increase the capability of existing controllable transmission projects that have UDRs, that provide a transmission interface to a Locality. When combined with Unforced Capacity which is located in an External Control Area or non-constrained NYCA region either by contract or ownership, and which is deliverable to the NYCA interface in the Locality in which the UDR transmission facility is electrically located, UDRs allow such Unforced Capacity to be treated as if it were located in the Locality, thereby contributing to an LSE's Locational Minimum Installed Capacity Requirement. To the extent the NYCA interface is with an External Control Area the Unforced Capacity associated with UDRs must be deliverable to the Interconnection Point (Source: MST Definitions)

Weather Normalized: Adjustments made to normalize the impact of weather when making energy and peak demand forecasts. Using historical weather data, energy analysts can account for the influence of extreme weather conditions and adjust actual energy use and peak demand to estimate what would have happened if the hottest day or the coldest day had been the typical, or "normal," weather conditions. "Normal" is usually calculated by taking the average of the previous 20 years of weather data.

Zone: One of the eleven regions in the NYCA connected to each other by identified transmission interfaces and designated as Load Zones A-K.

Appendix B - The Reliability Planning Process

This appendix presents an overview of the NYISO's Reliability Planning Process (RPP). A detailed discussion of the RPP, including applicable Reliability Criteria, is contained in NYISO Manual titled "Reliability Planning Process Manual 26," which is posted on the NYISO's website.

The NYISO RPP is an integral part of the NYISO's overall Comprehensive System Planning Process (CSPP). The CSPP is comprised of four components:

- Local Transmission Planning Process (LTPP),
- Reliability Planning Process (RPP), along with the newly defined quarterly Short Term Reliability Process (STRP)
- Congestion Assessment and Resource Integration Study (CARIS), and
- Public Policy Transmission Planning Process.

As part of the LTPP, local Transmission Owners perform transmission security studies for their BPTFs in their transmission areas according to all applicable criteria. Links to the Transmission Owner's LTPs can be found on the NYISO's website. The LTPP provides inputs for the RPP and STRP.

During the RPP, the NYISO conducts the Reliability Needs Assessment (RNA) and Comprehensive Reliability Plan (CRP). The RNA evaluates the resource adequacy and transmission security of the bulk power system over the RNA study period (i.e. year 4 through year 10). In identifying resource adequacy needs, the NYISO identifies the amount of resources in megawatts (known as "compensatory megawatts") and the locations in which they are needed to meet those needs. After the RNA is complete, the NYISO requests and evaluates market-based solutions, regulated backstop solutions, and alternative regulated solutions that address the identified Reliability Needs. This step results in the development of the CRP for the seven-year study period (*i.e.,* year 4 through year 10).

The RPP is a long-range assessment of both resource adequacy and transmission reliability of the New York bulk power system conducted over a seven-year planning horizon. There are two different aspects to analyzing the bulk power system's reliability in the RNA: adequacy and security. Adequacy is a planning and probabilistic concept. A system is adequate if the probability of having sufficient transmission and generation to meet expected demand is equal to or less than the system's standard, which is expressed as a loss of load expectation (LOLE). The New York State bulk power system is planned to meet an LOLE that, at any given point in time, is less than or equal to an involuntary load disconnection that is not more frequent than once in every 10 years, or 0.1 days per year. This requirement forms the basis of New York's installed reserve margin (IRM) resource adequacy requirement.

Transmission Security is an operating and deterministic concept. N-1 events are evaluated to assess their impact on the system, as viewed from the normal (or 'N') system condition. N-1-0 and N-1-1 analysis evaluates the ability of the system to meet design criteria after a critical element has already been lost. An N-1or N-1-1 violation occurs when the power flowing through a transmission element exceeds its applicable rating (thermal violation) or the voltage at a bus exceeds its specified range (voltage violation).

Certain areas of the Con Edison system are designed and operated for the occurrence of a second contingency. This type of combination can be described as N-1-1-0. For N-1-1-0 analysis, after the second contingency occurs, systems adjustments are allowed to secure the system back to normal ratings. The Con Edison planning criteria are contained in the NYSRC Reliability Rules, Rule G.1. Accordingly, a violation of the N-1-1-0 criterion on the BPTFs in the Con Edison Transmission District will be identified as a Reliability Need in the NYISO's Reliability Needs Assessment.

The RPP is anchored in the market-based philosophy of the NYISO and its Market Participants, which posits that market solutions should be the preferred choice to meet the identified Reliability Needs reported in the RNA. In the CRP, the reliability of the bulk power system is assessed and solutions to Reliability Needs evaluated in accordance with existing Reliability Criteria of the North American Electric Reliability Corporation (NERC), the Northeast Power Coordinating Council, Inc. (NPCC), and the New York State Reliability Council (NYSRC) as they may change from time to time. These criteria and a description of the nature of long-term bulk power system planning are described in detail in the applicable planning manual, and are briefly summarized below. In the event that market-based solutions do not materialize to meet a Reliability Need in a timely manner, the NYISO designates the Responsible TO or Responsible TOs or developer of an alternative regulated solution to proceed with a regulated solution in order to maintain system reliability. The NYISO may provide regulated cost recovery for transmission solutions constructed to meet a Reliability Need. Under the RPP, the NYISO also has an affirmative obligation to report historic congestion across the transmission system. In addition, the draft RNA is provided to the Market Monitoring Unit for review and consideration of whether market rules changes are necessary to address an identified failure, if any, in one of the NYISO's competitive markets. If market failure is identified as the reason for the lack of market-based solutions, the NYISO will explore appropriate changes in its market rules with its stakeholders and Independent Market Monitor. The RPP does not substitute for the planning that each TO conducts to maintain the reliability of its own bulk and non-bulk power systems.

The NYISO does not license or construct projects to respond to identified Reliability Needs reported in the RNA. The ultimate approval of those projects lies with regulatory agencies such as the FERC, the NYPSC/NYDPS, environmental permitting agencies, and local governments. The NYISO monitors the progress and continued viability of proposed market and regulated projects to meet identified needs, and reports its findings in annual plans.

In 2019, a major planning process was carved out of the RPP and defined as the Short-Term Reliability Process (STRP). This process was approved by the FERC and its requirements are contained in Attachments Y and FF of the NYISO's OATT. With this process in place, the RPP's Study Period changes from a year 1 to year 10 analysis, into a year 4 to year 10 look ahead. At the same time, the STRP evaluates year 1 through year 5 from the Short Term Assessment of Reliability (STAR) Start Date, with a focus on Short-Term Reliability Needs arising in years 1 through 3 of the Study Period.

Consistent with Section 38.2 of the OATT, Short-Term Reliability Process Needs that arise within three years of the later of (a) the conclusion of the 365 day prior notice period for that is described in Section 38.3.1.1 of the OATT for Generator Deactivation Reliability Needs, or (b) the posting of a completed Short-Term Assessment of Reliability (STAR) for other Reliability Needs on the BPTF, will be addressed using the Short-Term Reliability Process.

Short-Term Reliability Process Needs that arise in the Near Term (within three years) will be addressed using the Short-Term Reliability Process (STRP). Short-Term Reliability Process Needs that are not Near-Term needs on the BPTF (years 4 through 5) will only be addressed using the STRP if an identified Reliability Need cannot timely be addressed through the ISO's Reliability Planning Process. If the Reliability Need is handled through the STRP, the NYISO will solicit market-based solutions of all types, a regulated transmission solution(s), and service offers from Generators, as appropriate. The NYISO will select a solution(s) consistent with the STRP process which may include selecting Generators to remain in service under temporary Reliability Must Run (RMR) agreements until the transmission solution is complete.

STRP Needs that arise more than three years after the later of (x) the conclusion of the 365 day prior notice period for Generator Deactivation Reliability Needs, or (y) the posting of a completed STAR for other Reliability Needs on the BPTF, will only be addressed using the STRP if the identified Reliability Need cannot timely be addressed through the RPP set forth in this Attachment Y.

The CRP also provides inputs for the NYISO's economic planning process known as CARIS. CARIS Phase 1 examines congestion on the New York bulk power system and the costs and benefits of alternatives to alleviate that congestion. During CARIS Phase 2, the NYISO evaluates specific transmission project proposals for regulated cost recovery.

Another component of the CSPP is the Public Policy Transmission Planning Process. Under this component, interested entities propose, and the NYPSC identify, transmission needs driven by Public Policy Requirements. The NYISO then requests that interested entities submit proposed solutions to the Public Policy Transmission Need(s) identified by the NYPSC. The NYISO evaluates the viability and sufficiency of the proposed solutions to satisfy the identified Public Policy Transmission Need. Upon a confirmation by the NYPSC that a need for a transmission solution still exists, the NYISO then evaluates and may select the more efficient or cost-effective transmission solution to the identified need. The NYISO develops the Public Policy Transmission Planning Report containing its findings regarding the proposed solutions. This report is reviewed by NYISO stakeholders and approved by the Board of Directors.

In concert with each of the NYISO's regional planning processes, interregional planning is conducted with NYISO's neighboring control areas in the United States and Canada under the Northeastern ISO/RTO Planning Coordination Protocol. The NYISO participates in interregional planning and may consider Interregional Transmission Projects in its regional planning processes.

Figure 1 summarizes the CSPP and Figure 2 summarizes the RPP process.

Figure 1: NYISO's Comprehensive System Planning Process (CSPP)

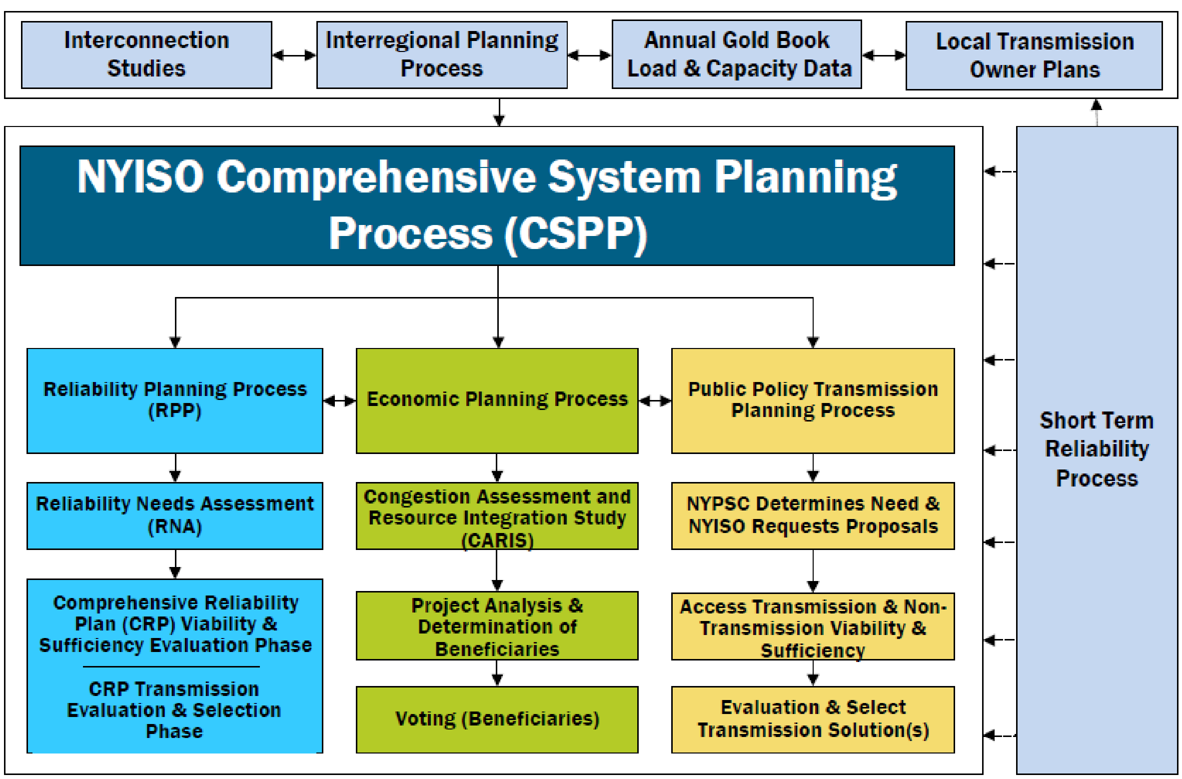
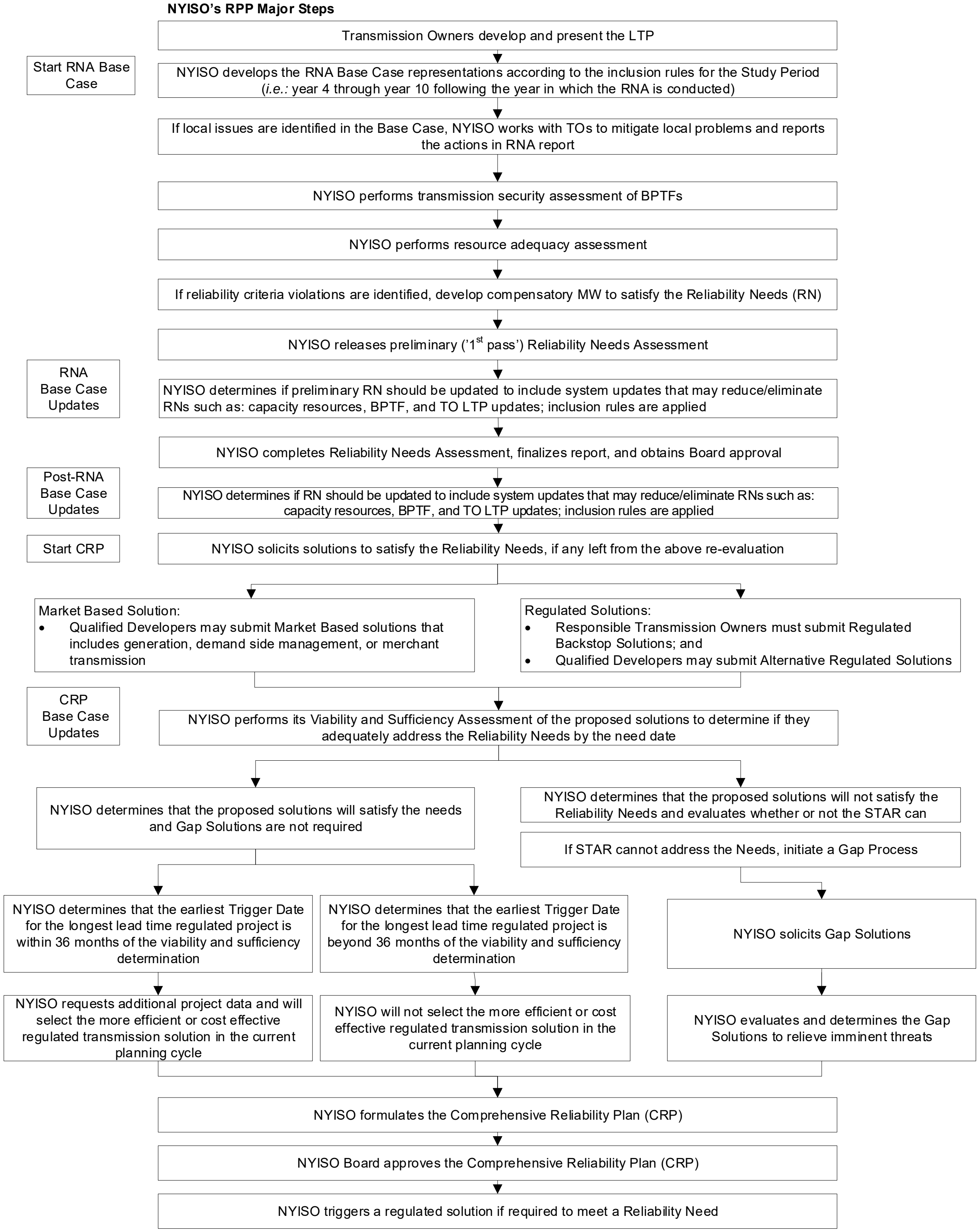


Figure 2: NYISO RPP



Notes:
* If an immediate threat to the reliability of the power system is identified, a Gap Solution outside of the normal RPP cycle may be requested by the NYISO Board.

Appendix C - Load and Energy Forecast 2021-2030

Historical Overview

In order to perform the 2020 RNA, a forecast of summer and winter peak demands and annual energy requirements was produced for the years 2020 - 2030. The New York Control Area (NYCA) is a summer peaking system and is expected to remain a summer peaking system over the study period. In longer term, the NYISO may become a winter peaking system in the mid-2030s due to increasing electrification primarily via heat pumps and electric vehicles. Both summer and winter peaks show considerable year-to-year variability due to the influence of peak-producing weather conditions for the seasonal peaks. Annual energy is also influenced by weather conditions over the entire year. However, the resulting variation in annual energy levels is relatively lower.

Figure 3 below reports the NYCA historic seasonal peaks and annual energy growth since 2010. The table provides both actual results and weather-normalized results, together with annual average growth rates for each table entry. The growth rates are averaged over the period 2010 to 2019.

Figure 3: Historical Energy and Seasonal Peak Demand - Actual and Weather-Normalized

	Annual Energy - GWh		Summer Peak - MW		Winter Peak - MW		
Year	Actual	Weather Normalized	Actual	Weather Normalized	Winter	Actual	Weather Normalized
2010	163,505	161,513	33,453	32,458	2010-11	24,654	24,452
2011	163,329	162,628	33,867	33,019	2011-12	23,901	24,630
2012	162,840	163,458	32,439	33,106	2012-13	24,659	24,630
2013	163,514	163,473	33,956	33,502	2013-14	25,739	24,610
2014	160,059	160,576	29,782	33,291	2014-15	24,648	24,500
2015	161,572	159,884	31,139	33,226	2015-16	23,319	24,220
2016	160,798	159,169	32,075	33,225	2016-17	24,164	24,416
2017	156,370	156,795	29,699	32,914	2017-18	25,081	24,265
2018	161,114	158,445	31,861	32,512	2018-19	24,727	24,114
2019	155,832	155,848	30,397	32,357	2019-20	23,253	24,123
	-0.53%	**-0.40%**	**-1.06%**	**-0.03%**		**-0.65%**	**-0.15%**

Forecast Overview

Figure 4 below shows historical and forecast growth rates of annual energy for five different regions in New York and in total. The 5 regions are Zones A to E, Zones F and G, H and I, Zone J, and Zone K. Figure 5 shows historical and forecast growth rates of summer and winter peak demand for the same 5 regions. The corresponding load forecast uncertainty values for each of 5 regions are also included.

Figure 4: Annual Energy and Average Growth – Actual and Forecast

	Annual Energy - GWh					
Year	**A to E**	**F&G**	**H&I**	**J**	**K**	**NYCA**
2010	54,458	21,778	9,233	55,114	22,922	163,505
2011	55,879	21,501	9,186	54,059	22,704	163,329
2012	56,238	21,784	9,029	53,487	22,302	162,840
2013	56,899	21,995	9,190	53,316	22,114	163,514
2014	55,132	21,844	8,974	52,541	21,568	160,059
2015	54,548	22,487	9,146	53,485	21,906	161,572
2016	54,286	22,273	8,995	53,653	21,591	160,798
2017	52,938	21,492	8,859	52,266	20,815	156,370
2018	55,210	22,340	8,878	53,360	21,326	161,114
2019	53,089	21,403	8,792	52,003	20,545	155,832
2020	51,275	20,635	8,277	48,964	19,869	149,020
2021	52,181	20,801	8,364	49,242	20,039	150,627
2022	52,856	20,887	8,450	49,715	20,206	152,114
2023	52,821	20,694	8,376	48,835	19,818	150,544
2024	52,808	20,532	8,372	48,628	19,564	149,904
2025	52,705	20,371	8,371	48,433	19,287	149,167
2026	52,561	20,230	8,388	48,444	19,104	148,727
2027	52,368	20,113	8,415	48,562	19,090	148,548
2028	52,170	20,036	8,453	48,777	19,347	148,783
2029	51,990	19,997	8,505	49,115	19,576	149,183
2030	51,864	20,006	8,560	49,450	19,894	149,774

	Average Annual Growth - Percent					
Period	A to E	F&G	H&I	J	K	NYCA
2010-19	-0.28%	-0.19%	-0.54%	-0.64%	-1.21%	-0.53%
2020-30	0.11%	-0.31%	0.34%	0.10%	0.01%	0.05%
2010-14	0.31%	0.08%	-0.71%	-1.19%	-1.51%	-0.53%
2014-19	-0.75%	-0.41%	-0.41%	-0.21%	-0.97%	-0.53%
2020-25	0.55%	-0.26%	0.23%	-0.22%	-0.59%	0.02%
2025-30	-0.32%	-0.36%	0.45%	0.42%	0.62%	0.08%

Figure 5: Actual and Forecast Seasonal Peak Demand and Average Growth, and LFU Multipliers

	Summer Coincident Peak - MW						Winter Coincident Peak - MW					
Year[1]	A to E	F&G	H&I	J	K	NYCA	A to E	F&G	H&I	J	K	NYCA
2010	9,483	4,738	2,187	11,213	5,832	33,453	8,617	3,411	1,453	7,661	3,512	24,654
2011	9,670	4,648	2,240	11,374	5,935	33,867	8,434	3,383	1,383	7,323	3,378	23,901
2012	9,932	4,630	2,046	10,722	5,109	32,439	8,885	3,462	1,457	7,456	3,399	24,659
2013	9,859	4,750	2,238	11,456	5,653	33,956	9,047	3,689	1,599	7,810	3,594	25,739
2014	8,212	4,069	1,917	10,567	5,017	29,782	8,789	3,481	1,491	7,481	3,406	24,648
2015	9,196	4,445	1,962	10,410	5,126	31,139	8,182	3,357	1,342	7,274	3,164	23,319
2016	9,437	4,451	2,028	10,990	5,169	32,075	8,534	3,416	1,447	7,482	3,285	24,164
2017	8,450	4,095	1,941	10,241	4,972	29,699	8,745	3,650	1,439	7,822	3,425	25,081
2018	8,985	4,568	2,024	10,890	5,394	31,861	8,504	3,684	1,475	7,674	3,390	24,727
2019	8,708	4,404	1,965	10,015	5,305	30,397	8,088	3,322	1,321	7,398	3,124	23,253
2020	9,269	4,519	2,077	11,316	5,115	32,296	8,392	3,462	1,351	7,551	3,374	24,130
2021	9,245	4,482	2,073	11,300	5,029	32,129	8,429	3,457	1,360	7,630	3,327	24,203
2022	9,235	4,457	2,081	11,397	4,958	32,128	8,490	3,462	1,385	7,847	3,290	24,474
2023	9,219	4,431	2,074	11,362	4,832	31,918	8,549	3,465	1,401	7,984	3,251	24,650
2024	9,206	4,412	2,076	11,395	4,749	31,838	8,613	3,473	1,427	8,202	3,229	24,944
2025	9,189	4,394	2,072	11,390	4,666	31,711	8,667	3,481	1,456	8,432	3,215	25,251
2026	9,172	4,382	2,079	11,446	4,591	31,670	8,715	3,491	1,492	8,720	3,217	25,635
2027	9,158	4,373	2,087	11,504	4,551	31,673	8,754	3,502	1,525	8,971	3,236	25,988
2028	9,149	4,371	2,095	11,583	4,558	31,756	8,789	3,518	1,560	9,259	3,278	26,404
2029	9,145	4,373	2,107	11,670	4,570	31,865	8,830	3,539	1,603	9,591	3,325	26,888
2030	9,147	4,381	2,118	11,757	4,589	31,992	8,875	3,569	1,647	9,934	3,363	27,388

	Average Annual Growth - Percent						Average Annual Growth - Percent					
Period	A to E	F&G	H&I	J	K	NYCA	A to E	F&G	H&I	J	K	NYCA
2010-19	-0.94%	-0.81%	-1.18%	-1.25%	-1.05%	-1.06%	-0.70%	-0.29%	-1.05%	-0.39%	-1.29%	-0.65%
2020-30	-0.13%	-0.31%	0.20%	0.38%	-1.08%	-0.09%	0.56%	0.30%	2.00%	2.78%	-0.03%	1.27%
2010-14	-3.53%	-3.73%	-3.24%	-1.47%	-3.69%	-2.86%	0.50%	0.51%	0.65%	-0.59%	-0.76%	-0.01%
2014-19	1.18%	1.59%	0.50%	-1.07%	1.12%	0.41%	-1.65%	-0.93%	-2.39%	-0.22%	-1.71%	-1.16%
2020-25	-0.17%	-0.56%	-0.05%	0.13%	-1.82%	-0.36%	0.65%	0.11%	1.51%	2.23%	-0.96%	0.91%
2025-30	-0.09%	-0.06%	0.44%	0.64%	-0.33%	0.18%	0.48%	0.50%	2.50%	3.33%	0.90%	1.64%

	Load Forecast Uncertainty Multipliers					Load Forecast Uncertainty Multipliers				
Bin	A to E	F&G	H&I	J	K	A to E	F&G	H&I	J	K
Bin 1	116.02%	117.17%	113.56%	110.73%	116.38%	112.22%	112.22%	112.22%	112.22%	112.22%
Bin 2	111.11%	111.70%	109.46%	107.33%	111.97%	107.77%	107.77%	107.77%	107.77%	107.77%
Bin 3	105.70%	105.70%	104.06%	102.89%	105.98%	103.69%	103.69%	103.69%	103.69%	103.69%
Bin 4	100.00%	99.36%	97.68%	97.67%	100.00%	100.00%	100.00%	100.00%	100.00%	100.00%
Bin 5	94.22%	92.89%	90.66%	91.91%	91.88%	96.69%	96.69%	96.69%	96.69%	96.69%
Bin 6	88.58%	86.48%	83.35%	85.86%	82.34%	93.76%	93.76%	93.76%	93.76%	93.76%
Bin 7	83.28%	80.33%	76.06%	79.79%	75.52%	91.22%	91.22%	91.22%	91.22%	91.22%

[1] Years listed reflect the NYISO capability year; For example, the year 2010 reflects the winter period spanning 2010-2011

Forecast Methodology

In addition to developing load forecasts for each of the load zones, the NYISO received and evaluated forecasts from all Transmission Owners, which were used in combination with the forecasts the NYISO developed. The NYISO employs a multi-stage process to develop load forecasts for each of the eleven zones within the NYCA.

In the first stage, baseline energy and peak models are built based on projections of end-use intensities and economic variables. End-use intensities modeled include those for lighting, refrigeration, cooking, heating, cooling, and other plug loads. Appliance end-use intensities are generally defined as the product of saturation levels (average number of units per household or commercial square foot) and efficiency levels (energy usage per unit or a similar measure). End-use intensities specific to New York are estimated from appliance saturation and efficiency levels in both the residential and commercial sectors. These intensities include the projected impacts of energy efficiency programs and improved codes and standards. Economic variables considered include Gross Domestic Product (GDP), households, population, and commercial and industrial employment. Projected long-term weather trends from the NYISO Climate Change Impact Study Phase I are included in the end-use models.

In the second stage, the incremental impacts of additional policy-based energy efficiency, behind-the-meter solar PV and distributed generation are deducted from the forecast; and the incremental impacts of electric vehicle usage and other electrification are added to the forecast. The impacts of net electricity consumption of energy storage units due to charging and discharging are added to the energy forecasts, while the peak reducing impacts of behind-the-meter energy storage units are deducted from the peak forecasts. In the final stage, the NYISO aggregates load forecasts by Zone. The 2020 summer peak forecast is the 2020 ICAP forecast.

Forecast Results

Figure 6 through Figure 16 include information on the 2020 Baseline forecast specific to the 2020 RNA look ahead period. Annual energy, summer, and winter peak forecasts and the corresponding average annual growth rates are provided for reference along with comparisons to the 2018 RNA baseline forecast used (Gold Book forecasts). Behind-the-meter impacts on summer peak reductions and total zonal peak requirements (demand and solar PV) are also provided.

Figure 6: Gold Book Baseline Energy Forecast Growth Rates - 2020 to 2030

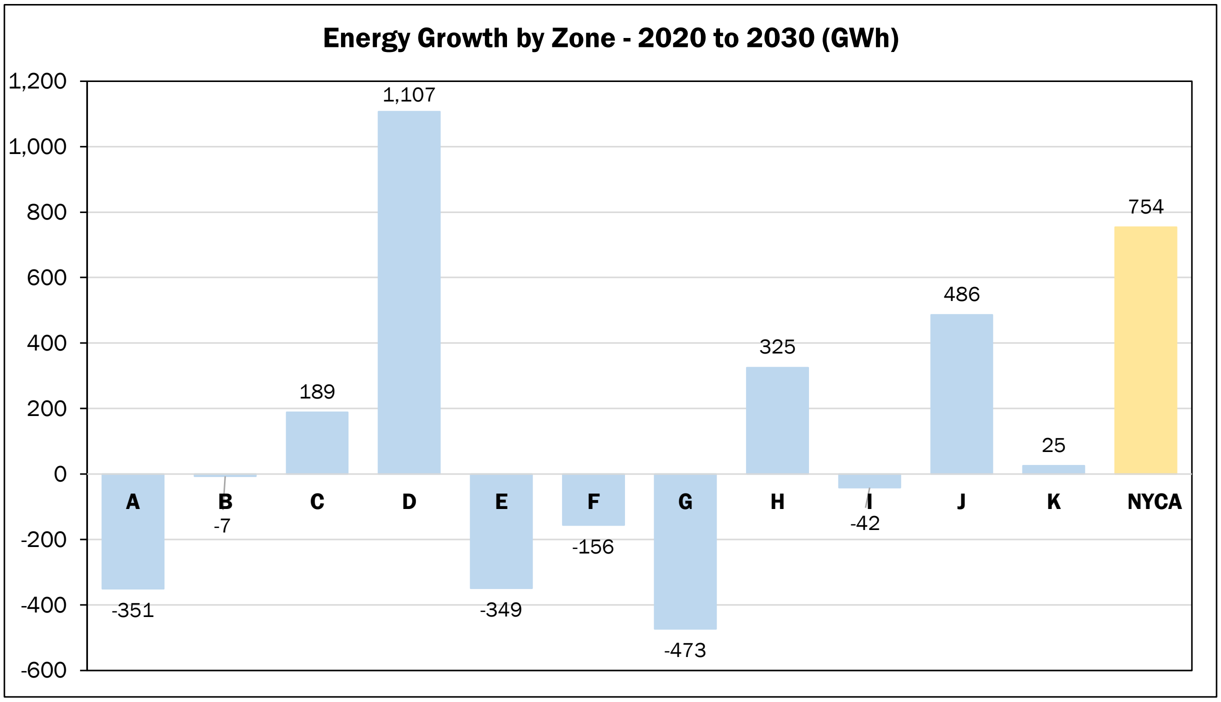


Figure 7: 2028 Energy Forecast Comparison between 2018 Gold Book and 2020 Gold Book

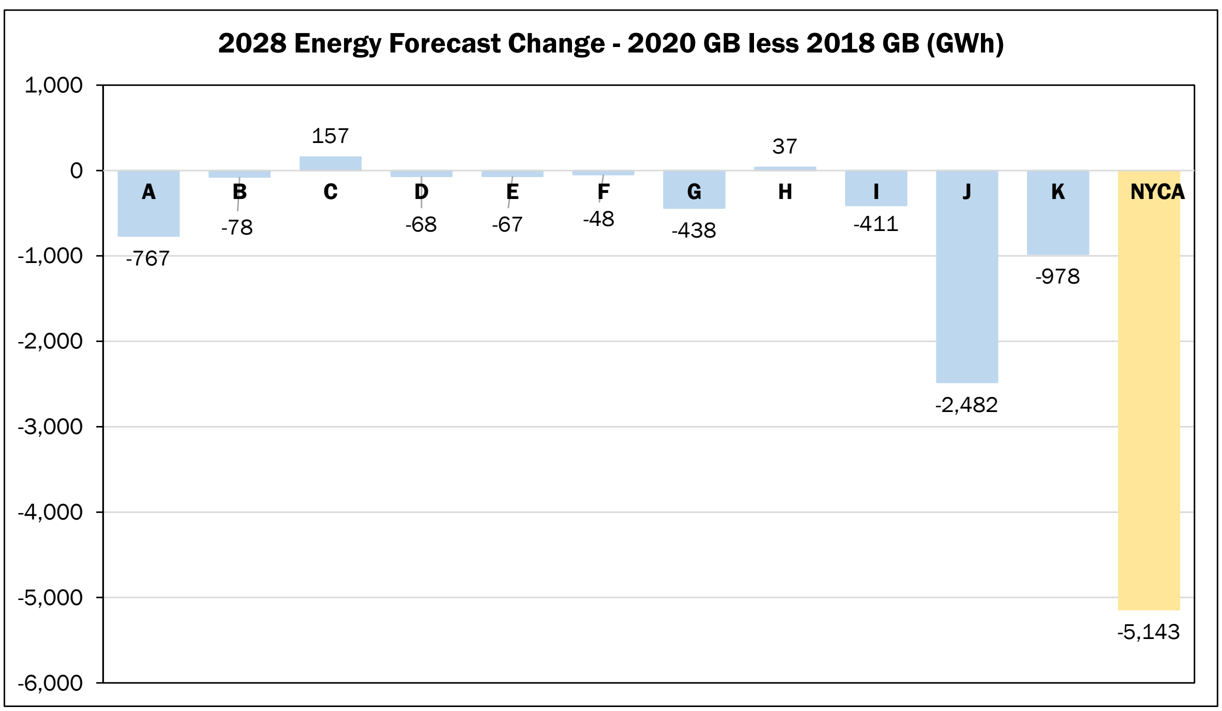


Figure 8: Gold Book Baseline Summer Coincident Peak Demand Forecast Growth Rates – 2020 to 2030

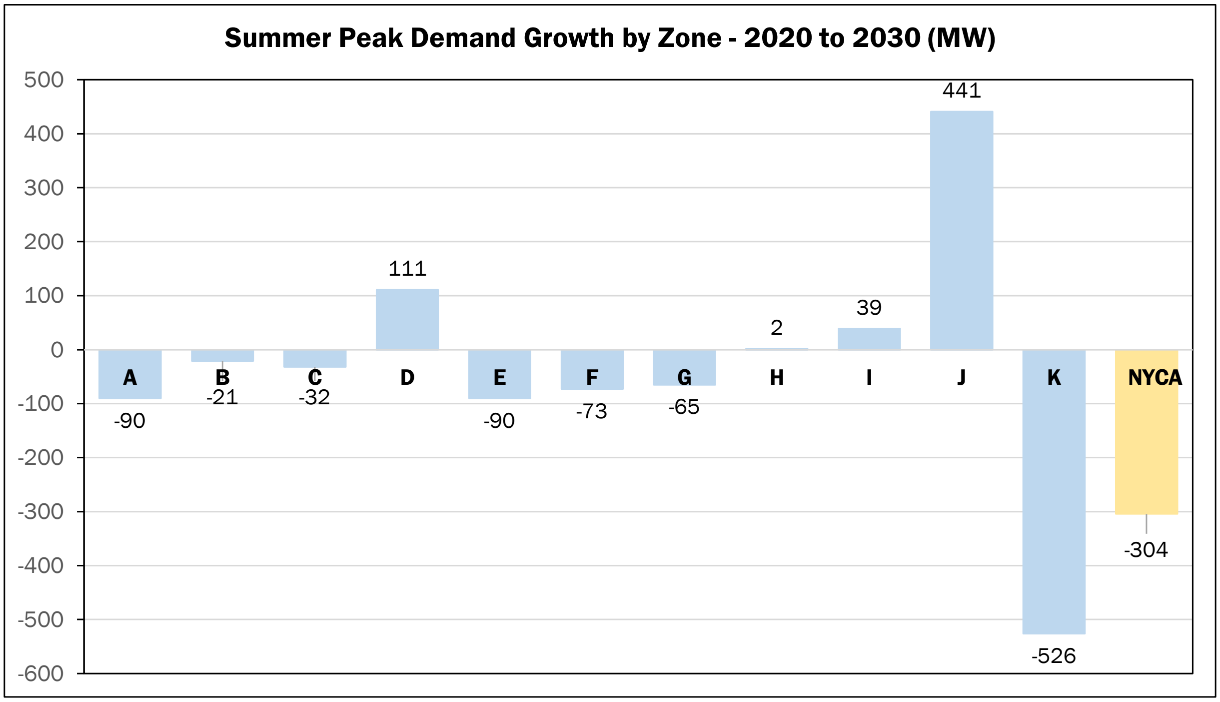


Figure 9: 2028 Summer Peak Forecast Comparison between 2018 Gold Book and 2020 Gold Book

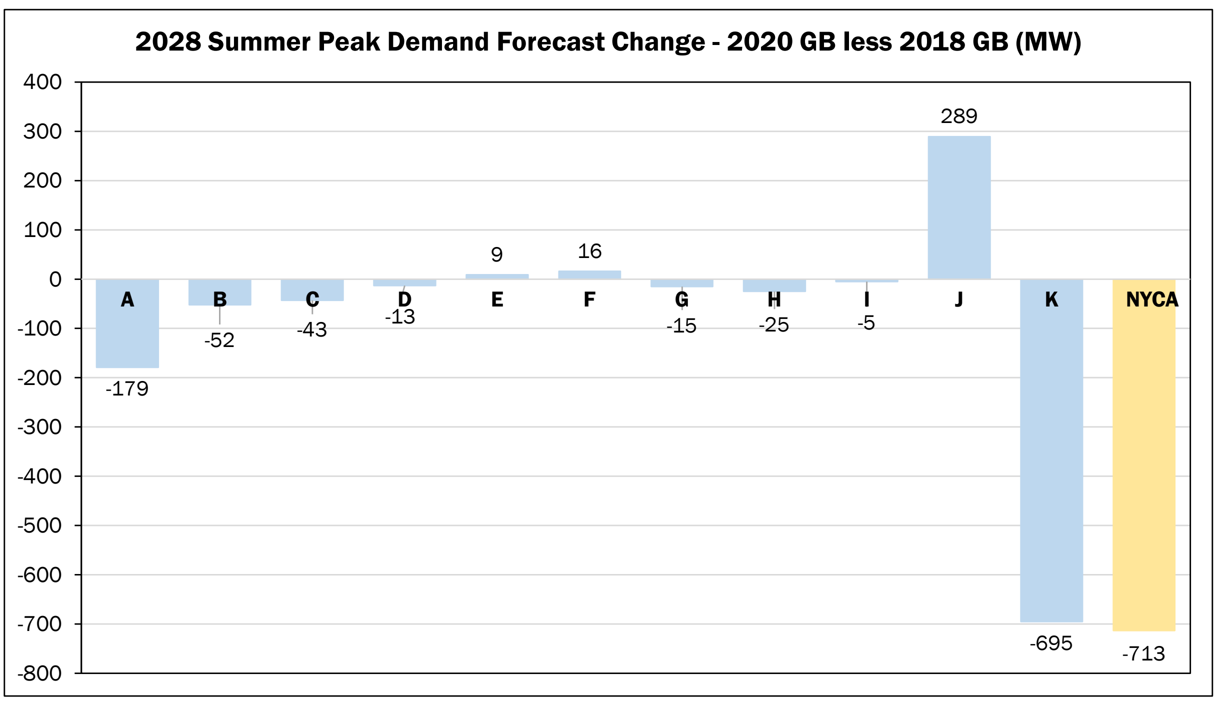


Figure 10: Annual Energy by Zone - Actual and 2020 Gold Book Baseline Forecast (GWh)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2010	15,903	10,128	16,209	4,312	7,906	11,394	10,384	2,969	6,264	55,114	22,922	163,505
2011	16,017	10,040	16,167	5,903	7,752	11,435	10,066	2,978	6,208	54,059	22,704	163,329
2012	15,595	10,009	16,117	6,574	7,943	11,846	9,938	2,930	6,099	53,487	22,302	162,840
2013	15,790	9,981	16,368	6,448	8,312	12,030	9,965	2,986	6,204	53,316	22,114	163,514
2014	15,890	9,902	16,347	4,835	8,158	12,010	9,834	2,886	6,088	52,541	21,568	160,059
2015	15,761	9,906	16,299	4,441	8,141	12,422	10,065	2,847	6,299	53,485	21,906	161,572
2016	15,803	9,995	16,205	4,389	7,894	12,298	9,975	2,856	6,139	53,653	21,591	160,798
2017	15,261	9,775	15,819	4,322	7,761	11,823	9,669	2,883	5,976	52,266	20,815	156,370
2018	15,894	10,090	16,561	4,670	7,995	12,375	9,965	2,807	6,071	53,360	21,326	161,114
2019	14,872	9,715	15,809	4,825	7,868	11,829	9,574	2,816	5,976	52,003	20,545	155,832
2020	14,282	9,468	15,182	4,818	7,525	11,449	9,186	2,669	5,608	48,964	19,869	149,020
2021	14,441	9,602	15,400	5,154	7,584	11,542	9,259	2,774	5,590	49,242	20,039	150,627
2022	14,540	9,697	15,578	5,431	7,610	11,612	9,275	2,847	5,603	49,715	20,206	152,114
2023	14,446	9,665	15,557	5,622	7,531	11,531	9,163	2,876	5,500	48,835	19,818	150,544
2024	14,367	9,643	15,558	5,777	7,463	11,475	9,057	2,899	5,473	48,628	19,564	149,904
2025	14,280	9,616	15,538	5,875	7,396	11,420	8,951	2,919	5,452	48,433	19,287	149,167
2026	14,196	9,585	15,514	5,930	7,336	11,375	8,855	2,935	5,453	48,444	19,104	148,727
2027	14,111	9,547	15,478	5,950	7,282	11,337	8,776	2,949	5,466	48,562	19,090	148,548
2028	14,038	9,510	15,438	5,948	7,236	11,312	8,724	2,963	5,490	48,777	19,347	148,783
2029	13,976	9,479	15,399	5,935	7,201	11,296	8,701	2,977	5,528	49,115	19,576	149,183
2030	13,931	9,461	15,371	5,925	7,176	11,293	8,713	2,994	5,566	49,450	19,894	149,774

Figure 11: Summer Coincident Peak Demand by Zone - Actual and 2020 Gold Book Baseline Forecast (MW)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2010	2,663	1,985	2,846	552	1,437	2,339	2,399	700	1,487	11,213	5,832	33,453
2011	2,556	2,019	2,872	776	1,447	2,233	2,415	730	1,510	11,374	5,935	33,867
2012	2,743	2,107	2,888	774	1,420	2,388	2,242	653	1,393	10,722	5,109	32,439
2013	2,549	2,030	2,921	819	1,540	2,392	2,358	721	1,517	11,456	5,653	33,956
2014	2,227	1,617	2,574	527	1,267	2,033	2,036	584	1,333	10,567	5,017	29,782
2015	2,632	1,926	2,705	557	1,376	2,294	2,151	617	1,345	10,410	5,126	31,139
2016	2,672	2,008	2,812	561	1,384	2,328	2,123	636	1,392	10,990	5,169	32,075
2017	2,439	1,800	2,557	502	1,152	2,032	2,063	607	1,334	10,241	4,972	29,699
2018	2,391	1,947	2,747	600	1,300	2,378	2,190	631	1,393	10,890	5,394	31,861
2019	2,367	1,841	2,592	603	1,305	2,224	2,180	652	1,313	10,015	5,305	30,397
2020	2,662	1,948	2,728	583	1,348	2,352	2,167	647	1,430	11,316	5,115	32,296
2021	2,641	1,943	2,719	613	1,329	2,329	2,153	646	1,427	11,300	5,029	32,129
2022	2,626	1,941	2,715	640	1,313	2,313	2,144	646	1,435	11,397	4,958	32,128
2023	2,610	1,938	2,711	663	1,297	2,297	2,134	646	1,428	11,362	4,832	31,918
2024	2,597	1,936	2,708	682	1,283	2,285	2,127	647	1,429	11,395	4,749	31,838
2025	2,585	1,935	2,705	693	1,271	2,276	2,118	647	1,425	11,390	4,666	31,711
2026	2,575	1,933	2,702	699	1,263	2,271	2,111	648	1,431	11,446	4,591	31,670
2027	2,569	1,932	2,700	700	1,257	2,269	2,104	648	1,439	11,504	4,551	31,673
2028	2,567	1,930	2,698	699	1,255	2,271	2,100	649	1,446	11,583	4,558	31,756
2029	2,569	1,928	2,697	696	1,255	2,274	2,099	649	1,458	11,670	4,570	31,865
2030	2,572	1,927	2,696	694	1,258	2,279	2,102	649	1,469	11,757	4,589	31,992

Figure 12: Winter Coincident Peak Demand by Zone - Actual and 2020 Gold Book Baseline Forecast (MW)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2010-11	2,413	1,606	2,657	645	1,296	1,825	1,586	526	927	7,661	3,512	24,654
2011-12	2,220	1,535	2,532	904	1,243	1,765	1,618	490	893	7,323	3,378	23,901
2012-13	2,343	1,568	2,672	954	1,348	1,923	1,539	510	947	7,456	3,399	24,659
2013-14	2,358	1,645	2,781	848	1,415	1,989	1,700	625	974	7,810	3,594	25,739
2014-15	2,419	1,617	2,689	725	1,339	1,925	1,556	537	954	7,481	3,406	24,648
2015-16	2,253	1,486	2,469	667	1,307	1,861	1,496	453	889	7,274	3,164	23,319
2016-17	2,295	1,600	2,573	671	1,395	1,867	1,549	530	917	7,482	3,285	24,164
2017-18	2,313	1,533	2,766	735	1,398	2,012	1,638	506	933	7,822	3,425	25,081
2018-19	2,107	1,566	2,668	747	1,416	2,066	1,618	534	941	7,674	3,390	24,727
2019-20	2,100	1,460	2,482	741	1,305	1,854	1,468	479	842	7,398	3,124	23,253
2020-21	2,227	1,559	2,525	751	1,330	1,899	1,563	493	858	7,551	3,374	24,130
2021-22	2,229	1,556	2,531	782	1,331	1,899	1,558	494	866	7,630	3,327	24,203
2022-23	2,240	1,557	2,547	810	1,336	1,907	1,555	498	887	7,847	3,290	24,474
2023-24	2,251	1,559	2,561	836	1,342	1,914	1,551	501	900	7,984	3,251	24,650
2024-25	2,266	1,564	2,576	858	1,349	1,925	1,548	505	922	8,202	3,229	24,944
2025-26	2,281	1,569	2,588	873	1,356	1,936	1,545	509	947	8,432	3,215	25,251
2026-27	2,296	1,575	2,598	883	1,363	1,948	1,543	513	979	8,720	3,217	25,635
2027-28	2,310	1,581	2,605	890	1,368	1,959	1,543	517	1,008	8,971	3,236	25,988
2028-29	2,325	1,587	2,610	893	1,374	1,971	1,547	522	1,038	9,259	3,278	26,404
2029-30	2,342	1,594	2,616	897	1,381	1,984	1,555	527	1,076	9,591	3,325	26,888
2030-31	2,360	1,602	2,624	901	1,388	1,999	1,570	532	1,115	9,934	3,363	27,388

Figure 13: 2020 Gold Book Behind-the-Meter Solar PV Baseline Annual Energy Reductions by Zone (GWh)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2020	199	95	261	18	202	431	363	49	64	335	614	2,631
2021	282	125	345	20	285	529	436	57	71	397	727	3,274
2022	384	158	437	24	381	631	505	63	78	460	778	3,899
2023	505	194	533	28	488	733	566	68	86	526	836	4,563
2024	635	230	622	34	592	831	614	72	93	588	882	5,193
2025	766	264	700	40	687	918	652	76	99	644	892	5,738
2026	885	294	762	48	766	992	681	77	105	694	901	6,205
2027	988	318	810	57	825	1,052	702	77	110	742	910	6,591
2028	1,069	337	846	66	868	1,096	716	79	115	782	919	6,893
2029	1,132	351	870	74	900	1,132	727	79	119	817	929	7,130
2030	1,178	360	889	83	922	1,158	736	80	120	825	938	7,289

Figure 14: 2020 RNA Base Case Annual Energy Forecast with BTM Solar PV Added Back (GWh)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2020	14,481	9,563	15,443	4,836	7,727	11,880	9,549	2,718	5,672	49,299	20,483	151,651
2021	14,723	9,727	15,745	5,174	7,869	12,071	9,695	2,831	5,661	49,639	20,766	153,901
2022	14,924	9,855	16,015	5,455	7,991	12,243	9,780	2,910	5,681	50,175	20,984	156,013
2023	14,951	9,859	16,090	5,650	8,019	12,264	9,729	2,944	5,586	49,361	20,654	155,107
2024	15,002	9,873	16,180	5,811	8,055	12,306	9,671	2,971	5,566	49,216	20,446	155,097
2025	15,046	9,880	16,238	5,915	8,083	12,338	9,603	2,995	5,551	49,077	20,179	154,905
2026	15,081	9,879	16,276	5,978	8,102	12,367	9,536	3,012	5,558	49,138	20,005	154,932
2027	15,099	9,865	16,288	6,007	8,107	12,389	9,478	3,026	5,576	49,304	20,000	155,139
2028	15,107	9,847	16,284	6,014	8,104	12,408	9,440	3,042	5,605	49,559	20,266	155,676
2029	15,108	9,830	16,269	6,009	8,101	12,428	9,428	3,056	5,647	49,932	20,505	156,313
2030	15,109	9,821	16,260	6,008	8,098	12,451	9,449	3,074	5,686	50,275	20,832	157,063

Figure 15: 2020 Gold Book Behind-the-Meter Solar PV Baseline Summer Coincident Peak Demand Reductions by Zone (MW)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2020	34	18	49	4	35	89	78	11	12	74	151	555
2021	49	24	67	4	51	111	96	13	14	90	188	707
2022	67	30	85	5	70	132	111	15	16	106	204	841
2023	88	37	104	5	91	152	125	16	18	122	228	986
2024	112	43	123	6	112	171	135	17	19	136	228	1,102
2025	136	49	138	8	131	187	142	17	21	148	227	1,204
2026	158	55	150	9	147	199	146	17	22	158	226	1,287
2027	176	59	158	11	159	208	147	17	23	168	225	1,351
2028	190	62	162	12	165	214	147	17	24	175	224	1,392
2029	199	63	164	14	168	216	145	16	24	180	222	1,411
2030	203	63	163	15	169	215	143	16	24	180	220	1,411

Figure 16: 2020 RNA Base Case Summer Coincident Peak Demand Forecast with BTM Solar PV Added Back (MW)

Year	A	B	C	D	E	F	G	H	I	J	K	NYCA
2020	2,696	1,966	2,777	587	1,383	2,441	2,245	658	1,442	11,390	5,266	32,851
2021	2,690	1,967	2,786	617	1,380	2,440	2,249	659	1,441	11,390	5,217	32,836
2022	2,693	1,971	2,800	645	1,383	2,445	2,255	661	1,451	11,503	5,162	32,969
2023	2,698	1,975	2,815	668	1,388	2,449	2,259	662	1,446	11,484	5,060	32,904
2024	2,709	1,979	2,831	688	1,395	2,456	2,262	664	1,448	11,531	4,977	32,940
2025	2,721	1,984	2,843	701	1,402	2,463	2,260	664	1,446	11,538	4,893	32,915
2026	2,733	1,988	2,852	708	1,410	2,470	2,257	665	1,453	11,604	4,817	32,957
2027	2,745	1,991	2,858	711	1,416	2,477	2,251	665	1,462	11,672	4,776	33,024
2028	2,757	1,992	2,860	711	1,420	2,485	2,247	666	1,470	11,758	4,782	33,148
2029	2,768	1,991	2,861	710	1,423	2,490	2,244	665	1,482	11,850	4,792	33,276
2030	2,775	1,990	2,859	709	1,427	2,494	2,245	665	1,493	11,937	4,809	33,403

Appendix D - Resource Adequacy and Transmission System Security Assessments

The analysis performed during the Reliability Needs Assessment requires the development of base cases for transmission security analysis and for resource adequacy analysis. The power flow system model is used for transmission security assessment and also for the development of the transfer limits to be implemented in the Multi-Area Reliability Simulation (MARS) model. The NYISO conducts comprehensive assessment of the transmission system through a series of steady-state power flow, transient stability, and short circuit studies.

The NYISO used the MARS model to determine whether adequate resources would be available to meet the NYSRC and NPCC reliability criteria of one day in ten years (0.1 days/year). The results identify LOLE violations, and details are in the Section 6 of the RNA report.

The MARS model was also used to evaluate selected scenarios.

2020 RNA Assumptions Matrix

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
Load Parameters				
1	Peak Load Forecast	Adjusted 2018 Gold Book NYCA baseline peak load forecast. The GB 2018 baseline peak load forecast includes the impact (reduction) of behind-the-meter (BtM) solar at the time of NYCA peak. For the Resource Adequacy load model, the deducted BtM solar MW was added back to the NYCA zonal loads, which then allows for a discrete modeling of the BtM solar resources.	Similar method	2 variations, same as the two CARIS 70x30 Scenarios: 1. RNA 70x30 NYCA High Load, similar to CARIS's Case Labeled 'Base Load' 2. RNA 70x30 NYCA Low Load, similar to CARISs Case Labeled "Scenario Load"
2	Load Shapes (Multiple Load Shapes)	Used Multiple Load Shape MARS Feature 8,760 hour historical load shapes were used as base shapes for LFU bins: Bin 1: 2006 Bin 2: 2002 Bins 3-7: 2007 Peak adjustments on a seasonal basis. For the BtM Solar adjustment, the BtM shape is added back to account for the impact of the BtM generation on both on-peak and off-peak hours.	Similar method	Single year load shape that includes BtM taken directly from CARIS 70x30 Case original load (losses not included)
3	Load Forecast Uncertainty (**LFU**)	Used updated summer LFU values for the 11 NYCA zones.	Updated via Load Forecast Task Force (LFTF) process Reference: April 13 2020 LFTF presentation: https://www.nyiso.com/documents/20142/11883362/LFU_Summary.pdf	Same as 2020 RNA Base Case
Generation Parameters				

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
1	Existing Generating Unit Capacities	2018 Gold Book values. Use summer min (DMNC vs. CRIS). Use winter min (DMNC vs. CRIS). Adjusted for RNA inclusion rules.	Similar method	Same as 2020 RNA Base Case
2	Proposed New Units Inclusion Determination	GB2018 with Inclusion Rules Applied	Similar method	Off-shore wind, land-based wind and utility scale PV added to align with CARIS 70x30 Case Renewable Resources mix
3	Retirement, Mothballed Units, IIFO	GB2018 with Inclusion Rules Applied	Similar method	Units that are retired in 2020 RNA Base Case. Additionally, all unit impacted by DEC's Peaker Rule were removed to align with CARIS 70x30 Case assumptions
4	Forced and Partial Outage Rates	Five-year (2013-2017) GADS data for each unit represented. Those units with less than five years – use representative data. Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period For new units or units that are in service for less than three years, NERC 5-year class average EFORd data are used.	Similar method	Same as 2020 RNA Base Case
5	Planned Outages	Based on schedules received by the NYISO and adjusted for history	Similar method	Same as 2020 RNA Base Case
6	Summer Maintenance	Nominal 50 MW (25 in J and 25 in K)	None	Same as 2020 RNA Base Case

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
7	Combustion Turbine Derates	Derate based on temperature correction curves For new units: used data for a unit of same type in same zone, or neighboring zone data.	Similar method	Same as 2020 RNA Base Case
8	Existing Landfill Gas Plants	New method: Actual hourly plant output over the period 2013-2017. Program randomly selects a LFG shape of hourly production over the 2013-2017 for each model replication. Probabilistic model is incorporated based on five years of input shapes, with one shape per replication randomly selected in the Monte Carlo process.	Similar method	Same as 2020 RNA Base Case
9	Existing **Wind** Units (>5 years of data)	Actual hourly plant output over the period 2013-2017. Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process	Similar method	8,760 hourly shapes based on output profile from CARIS 70x30 case. Notes: 1. CARIS 70x30 case output profile captures curtailments observed in the CARIS MAPS simulations 2. CARIS 70x30 case wind shape input based on 2009 NREL data.
10	Existing **Wind** Units (<5 years of data)	For existing data, the actual hourly plant output over the period 2013-2017 is used. For missing data, the nameplate normalized average of units in the same load zone is scaled by the unit's nameplate rating.	Similar method	8,760 hourly shapes based on output profile from CARIS 70x30 case. Notes: 1. CARIS 70x30 case output profile captures curtailments observed in the CARIS MAPS simulations 2. CARIS 70x30 case wind shape input

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
				based on 2009 NREL data.
11a	Proposed **Land based Wind** Units	Inclusion Rules Applied to determine the generator status. The nameplate normalized average of units in the same load zone is scaled by the unit's nameplate rating.	Similar method	8,760 hourly shapes based on output profile from CARIS 70x30 case. Notes: 1. CARIS 70x30 case output profile captures curtailments observed in the CARIS MAPS simulations 2. CARIS 70x30 case wind shape input based on 2009 NREL data.
11b	Proposed **Offshore Wind** Units	N/A	N/A	8,760 hourly shapes based on output profile from CARIS 70x30 case. Notes: 1. CARIS 70x30 case output profile captures curtailments observed in the CARIS MAPS simulations 2. CARIS 70x30 case wind shape input based on 2009 NREL data.
12a	Existing **Utility-scale Solar Resources**	The 31.5 MW Upton metered solar capacity: probabilistic model chooses from 5 years of production data output shapes covering the period 2013-2017 (one shape per replication is randomly selected in Monte Carlo process.)	Similar method	8,760 hourly shapes based on output profile from CARIS 70x30 case. Notes: 1. CARIS 70x30 case output profile captures curtailments. 2. CARIS 70x30 case existing utility scale PV shape input based on Y2017 historical data.

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
12b	Proposed **Utility-scale Solar Resources**	Inclusion Rules Applied to determine the generator status. The nameplate normalized average of units in the same load zone is scaled by the unit's nameplate rating.	Similar method	8,760 hourly shapes based on output profile from CARIS 70x30 case. Notes: 1. CARIS 70x30 case output profile captures curtailments. 2. CARIS 70x30 case future utility scale PV shape input based on 2006 NREL data.
13	Projected **BtM Solar Resources**	The large projection of increasing retail (BtM) solar installations over the 10-year period require a discrete model with detailed hourly performance. **New method:** A 8,760 hourly shape was created by using NREL's PV Watt[1] tool. MARS will randomly select a daily shape from the current month for each day of each month of each replication.	**New Method:** Will use 5-year of inverter production data. Probabilistic model is incorporated based on five years of input shapes with one shape per replication being randomly selected in Monte Carlo process **Reference**: April 6, 2020 TPAS/ESPWG meeting materials	8,760 hourly shape from CARIS 70x30 output. Note: CARIS BtM solar profile based on hourly shape created using NREL's PV Watt tool.
14	Existing **BTM-NG Program**	**New category:** These are former load modifiers to sell capacity into the ICAP market. Modeled as cogen type 2 unit in MARS. Unit capacity set to CRIS value, load modeled with weekly pattern that can change monthly.	Similar method	Same as 2020 RNA Base Case
15	Existing **Small Hydro** Resources	**New method:** Actual hourly plant output over the period 2013-2017. Program randomly selects a hydro shape of hourly production over the 5-year window for each model replication. The randomly	Similar method	Same as 2020 RNA Base Case

[1] NREL's PVWatts Calculator, credit of the U.S. Department of Energy (DOE)/NREL/Alliance (Alliance for Sustainable Energy, LLC).

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
		selected shape is multiplied by their current nameplate rating.		
16	Existing Large Hydro	Probabilistic Model based on 5 years of GADS data. Transition Rates representing the Equivalent Forced Outage Rates (EFORd) during demand periods over the most recent five-year period (2013-2017). Methodology consistent with thermal unit transition rates.	Similar method	Same as 2020 RNA Base Case
17	Proposed Energy Storage	N/A	N/A	Utilize MARS Energy Storage model, which allows for charging and discharging, and also includes temporal constraints (e.g., hours/days or hours/month)
Transaction - Imports / Exports				
1	Capacity Purchases	Grandfathered Rights and other awarded long-term rights Modeled using MARS explicit contracts feature.	Similar method	Same as 2020 RNA Base Case except for imports from HQ, see HQ section for additional information. Add 1310 MW HVDC connection between HQ and Zone J
2	Capacity Sales	These are long-term contracts filed with FERC. Modeled using MARS explicit contracts feature. Contracts sold from ROS (Zones: A-F). ROS ties to external pool are derated by sales MW amount	Similar method	Same as 2020 RNA Base Case

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
3	FCM Sales	Model sales for known years Modeled using MARS explicit contracts feature. Contracts sold from ROS (Zones: A-F). ROS ties to external pool are derated by sales MW amount	Similar method	Same as 2020 RNA Base Case
4	UDRs	Updated with most recent elections/awards information (VFT, HTP, Neptune, CSC)	Similar method	Same as 2020 RNA Base Case
5	EDRs	N/A	**New category:** Cedars Uprate 80 MW. Increased the HQ to D by 80 MW. Note: the Cedar bubble has been removed and its corresponding MW was reflected in HQ to D limit. References: 1. March 16, 2020 ESPWG/TPAS 2. April 6, 2020 TPAS/ESPWG	Not modeled (see HQ section for additional information)
6	Wheel-Through Contract	n/a	**New category:** 300 MW HQ through NYISO to ISO-NE. Modeled as firm contract. Reduced the transfer limit from HQ to NYISO by 300 MW and increased the transfer limit from NYISO to ISO-NE by 300 MW.	Not modeled (see HQ section for additional information)
MARS Topology: a simplified bubble-and-pipe representation of the transmission system				
0			**Summary of major topology changes** (as compared with the 2018-2019 RPP): Link1)-7); Link8)-9); Link10)	Same as 2020 RNA Base Case + LIPA topology updates for the 70x30 scenario additional (to the Base Case) peakers removal

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
			1) Marion-Farragut 345kV cables (B and C) assumed out of service 2) 71, 72, M51, M52 series reactors assumed by-passed after deactivation of Indian Point 3) Moses – St. Lawrence (L33P) tie line assumed out of service 4) Rainey – Corona transmission project in service impacting J to K limits 5) UPNY-SENY simplification 2021-2023 before the addition of AC PPTPP projects 6) AC PPTPs Segment A and B Projects Added starting 2024 7) Removal of Cedars bubble/tie to Zone D model; adding the MW from the bubble to the tie HQ to D tie limit. 8) Removal of PJM-SENY Group Interface 9) Updates to Zone K Imports/Exports 10) Somerset retirement impacts 11) The external areas model for PJM and ISO-NE were simplified by consolidating the 5 PJM areas (bubbles) into one, and the 8 ISO-NE areas into one.	
1	Interface Limits	Developed by review of previous studies and	Similar method	Same as 2020 RNA Base Case

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
		specific analysis during the RNA study process		
2	New Transmission	Based on TO- provided firm plans (via Gold Book 2018 process) and proposed merchant transmission; inclusion rules applied	Similar method	Same as 2020 RNA Base Case
3	AC Cable Forced Outage Rates	All existing cable transition rates updated with data received from ConEd and PSEG-LIPA to reflect most recent five-year history	Similar method	Same as 2020 RNA Base Case
4	UDR unavailability	Five-year history of forced outages	Similar method	Same as 2020 RNA Base Case
Emergency Operating Procedures				
1	Special Case Resources	SCRs sold for the program discounted to historic availability (“effective capacity”). Summer values calculated from the latest available July registrations, held constant for all years of study. 5 calls/month	Similar method but with 15 calls/year Note: also, combined the two SCR steps (generation and load zonal MW)	Same as 2020 RNA Base Case
2	EDRP Resources	2018 Gold Book with effective capacity modeled. Resources sold for the program and discounted to historic availability. Summer values calculated from July 2018 registrations and forecast growth. Values held constant for all years of study.	Not modeled: the values are less than 2 MW.	Same as 2020 RNA Base Case
3	Other EOPs	Based on TO information, measured data, and NYISO forecasts	Similar method	Same as 2020 RNA Base Case
External Control Areas				

#	Parameter	2018 RNA/CRP (2018 GB) Study Period: 2019 -2028	2020 RNA (2020 GB) Study Period: 2024(y4) - 2030 (y10)	2020 RNA 70x30 Scenario Case Study Period: 2030
1	PJM	As per RNA Procedure External model (load, capacity, topology) provided by PJM/NPCC CP-8 WG. PJM is a 5-zone model. LOLE of pool adjusted to be between 0.10 and 0.15 days per year by adjusting capacity pro-rata in all areas.	New model: Simplified model: The 5 PJM MARS areas (bubbles) were consolidated into one	Same as 2020 RNA Base Case
2	ISONE	As per RNA Procedure External model (load, capacity, topology) provided by PJM/NPCC CP-8 WG. LOLE of pool adjusted to be between 0.10 and 0.15 days per year by adjusting capacity pro-rata in all areas.	New model: Simplified model: The 8 ISO-NE MARS areas (bubbles) were consolidated into one	Same as 2020 RNA Base Case
3	HQ	As per RNA Procedure External model (load, capacity, topology) provided by PJM/NPCC CP-8 WG. LOLE of pool adjusted to be between 0.10 and 0.15 days per year by adjusting capacity pro-rata in all areas.	Similar method	HQ bubble not modeled for consistency with CARIS. Imports from HQ modeled as injections based upon usage profile from MAPS analysis. No flows between HQ and IESO or ISONE.
4	IESO	As per RNA Procedure External model (load, capacity, topology) provided by PJM/NPCC CP-8 WG. LOLE of pool adjusted to be between 0.10 and 0.15 days per year by adjusting capacity pro-rata in all areas.	Similar method	Same as 2020 RNA Base Case
5	Reserve Sharing	All NPCC Control Areas indicate that they will share reserves equally among all members before sharing with PJM.	Similar method	Same as 2020 RNA Base Case
6	NYCA Emergency Assistance Limit	Implemented a statewide limit of 3,500 MW	Similar method	Implemented a statewide (excluding assistance from HQ) limit of 3,500 MW
Miscellaneous				
1	MARS Model Version	Version 3.22.6	3.29.1499	3.29.1499

Assumptions Matrix for Transmission Security Assessment

Parameter	2020 RNA Transmission Security Studies Modeling Assumptions	2020 RNA 70x30 Scenario Case Study Period: 2030	Source
Peak Load	NYCA baseline coincident summer peak forecast, which already includes EE and DG (including solar) reductions.	NYCA baseline coincident summer peak forecast for 2030 with adjustments to BTM Solar in accordance with the CARIS 70x30 Base Load.	2020 Gold Book
Load Model	ConEd: voltage varying	No Change	2020 FERC 715 filing
	Rest of NYCA: constant power	No Change	
System Representation	Per updates received through Databank process (Subject to RNA base case inclusion rules).	No Change	NYISO RAD Manual, 2020 FERC 715 filing
Inter-area Interchange Schedules	Consistent with ERAG MMWG interchange schedule.	No Change	2020 FERC 715 filing, MMWG
Inter-area Controllable Tie Schedules	Consistent with applicable tariffs and known firm contracts or rights.	No Change	2020 FERC 715 filing
In-City Series Reactors	Consistent with ConEdison operating protocol. Note: series reactors on 71, 72, M51, and M52 are modeled by-passed with Y49, 41, and 42 series reactors modeled in-service.	No Change	2020 FERC 715 filing, Con Edison protocol
SVCs, FACTS	Set at zero pre-contingency; allowed to adjust post-contingency	No Change	NYISO T&D Manual
Transformer & PAR taps	Taps allowed to adjust pre-contingency; fixed post-contingency.	No Change	2020 FERC 715 filing
Switched Shunts	Allowed to adjust pre-contingency; fixed post-contingency.	No Change	2020 FERC 715 filing
Fault Current analysis settings	Per Fault Current Assessment Guideline.	No Change	NYISO Fault Current Assessment Guideline

Summary of Proposed Generation and Transmission Assumptions

The figures below summarize similar information from the report, depicted in different ways.

Figure 17: Generation Additions by Year

Summer of Year	New unit Addition	Zone	MW (Summer)	Total Additions
Y2021	-	-	0	0
Y2022	Cassadaga Wind	A	126	126
	Baron Winds	C	238	364
	Eight Point Wind Enery Center	B	101	466
	Roaring Brook Wind	E	80	545
	Calverton Solar Energy Center	K	23	568
Y2023	Ball Hill Wind	A	100	668
Y2024	-	-	0	668
Y2025	-	-	0	668
Y2026	-	-	0	668
Y2027	-	-	0	668
Y2028	-	-	0	668
Y2029	-	-	0	668
Y2030	-	-	0	668

Figure 18: Deactivations and Peaker Rule Status Change by Year

Summer of Year	Retired Unit	Zone	MW (Summer)	Total Removal
Y2021	Somerset	A	676	676
	Albany LFG	F	5	681
	Indian Point 2	H	1,012	1,692
	West Babylon	K	49	1,741
	Indian Point 3	H	1,036	2,778
Y2022	-	-	0	2,778
Y2023	Zone A	A	0	2,778
	Zone G	G	38	2,816
	Zone J	J	773	3,589
	Zone K	K	36	3,625
Y2024	-	-	0	3,625
Y2025	Zone A	A	0	3,625
	Zone G	G	0	3,625
	Zone J	J	605	4,230
	Zone K	K	0	4,230
Y2026	-	-		4,230
Y2027	-	-		4,230
Y2028	-	-		4,230
Y2029	-	-		4,230
Y2030	-	-		4,230

Figure 19: NYCA and Zone J Summaries

Year	NYCA (MW)				
	Additions	Reratings	Deactivations	Net capacity	Summer Coincident Baseline Load
Y2021	0	0	2,778	37,334	32,129
Y2022	568	0	2,778	37,902	32,128
Y2023	668	0	3,625	37,155	31,918
Y2024	668	0	3,625	37,155	31,838
Y2025	668	0	4,230	36,551	31,711
Y2026	668	0	4,230	36,551	31,670
Y2027	668	0	4,230	36,551	31,673
Y2028	668	0	4,230	36,551	31,756
Y2029	668	0	4,230	36,551	31,865
Y2030	668	0	4,230	36,551	31,992

Year	Zone J (MW)				
	Additions	Reratings	Deactivations	Net capacity	Peak Load
Y2021	0	0	0	9,568	11,300
Y2022	0	0	0	9,568	11,397
Y2023	0	0	773	8,795	11,362
Y2024	0	0	773	8,795	11,395
Y2025	0	0	1,378	8,190	11,390
Y2026	0	0	1,378	8,190	11,446
Y2027	0	0	1,378	8,190	11,504
Y2028	0	0	1,378	8,190	11,583
Y2029	0	0	1,378	8,190	11,670
Y2030	0	0	1,378	8,190	11,757

The additional proposed projects from the Interconnection Queue are shown in Figure 20 and Figure 21.

Figure 20: Additional Proposed Generation Projects from the 2020 Gold Book

Queue	Owner/ Operator	Proposed Generator Project	Zone	Proposed Date*	Requested CRIS (MW)[1]	Summer (MW)
Completed Class Year Facilities Study						
387	Cassadaga Wind, LLC	Cassadaga Wind	A	Dec-20	126.0	126.5
396	Baron Winds, LLC	Baron Winds	C	Dec-20	300.0	238.4
422	NextEra Energy Resources, LLC	Eight Point Wind Enery Center	B	Dec-20	101.2	101.8
363	Anbaric Development Parners, LLC	Poseidon Offshore	K	Jan-21	500.0	500.0
349	Taylor Biomass Energy Montgomery, LLC	Taylor Biomass	G	Apr-21	19.0	19.0
505	RES America Development Inc.	Ball Hill Wind	A	Dec-22	100.0	100.0
393	NRG Berrians East Development, LLC	Berrians East Replacement	J	Feb-23	508.0	431.0
Completed CRIS Requests						
430	HQUS	Cedar Rapids Transmission Upgrade	D	Oct-21	80.0	N/A
Class Year 2019						
618	North Park Energy, LLC	High River Solar	F	Nov-20	90.0	90.0
519	Canisteo Wind Energy LLC	Canisteo Wind	C	Dec-20	290.7	290.7
531	Invenery Wind Development LLC	Number 3 Wind Energy	E	Dec-20	105.8	105.8
546	Atlantic Wind, LLC	Roaring Brook Wind	E	Dec-20	79.7	79.7
579	Bluestone Wind, LLC	Bluestone Wind	E	Dec-20	124.2	124.2
617	North Park Energy, LLC	Watkins Glen Solar	C	Dec-20	50.0	50.0
678	LI Solar Generation, LLC	Calverton Solar Energy Center	K	Dec-20	22.9	22.9
683	KCE NY 2, LLC	KCE NY 2	G	Jun-21	200.0	200.0
535	sPower Development Company, LLC	Riverhead Expansion	K	Oct-21	36.0	36.0
644	Hecate Energy Columbia County 1, LLC	Columbia County 1	F	Oct-21	60.0	60.0
495	Mohawk Solar LLC	Mohawk Solar	F	Nov-21	90.5	90.5
571	Heritage Renewables, LLC	Heritage Wind	A	Nov-21	200.1	200.1
591	Geronimo Energy, LLC	High Top Solar	C	Nov-21	20.0	20.0
629	Silver Lake Solar, LLC	Silver Lake Solar	C	Nov-21	24.9	24.9
637	Flint Mine Solar LLC	Flint Mine Solar	G	Nov-21	100.0	100.0
706	High Brigde Wind, LLC	High Brigde Wind	E	Nov-21	100.8	100.8
560	Atlantic Wind, LLC	Deer River Wind	E	Dec-21	100.0	100.0
594	North Park Energy, LLC	NW Energy	C	Dec-21	60.0	60.0
595	North Park Energy, LLC	SW Energy	A	Dec-21	100.0	100.0
596	Invenergy Wind Development LLC	Alle Catt II Wind	A	Dec-21	339.8	339.8
619	North Park Energy, LLC	East Point Solar	F	Dec-21	50.0	50.0
697	Helix Ravenswood, LLC	Ravenswood Energy Storage 1	J	May-22	129.0	129.0
698	Helix Ravenswood, LLC	Ravenswood Energy Storage 2	J	May-22	129.0	129.0
746	Energy Storage Resouces, LLC	Peconic River Energy Storage	K	Jun-22	150.0	150.0
620	North Park Energy, LLC	North Side Solar	D	Nov-22	180.0	180.0
718	Cortland Energy Center,LLC	Cortland Energy Center	C	Nov-22	50.0	50.0
720	North Light Energy Center, LLC	North Light Energy Center	C	Nov-22	80.0	80.0
721	Excelsior Energy Center, LLC	Excelsior Energy Center	A	Nov-22	280.0	280.0
612	Deepwater Wind South Fork, LLC	South Fork Wind Farm	K	Dec-22	96.0	96.0
695	Deepwater Wind South Fork, LLC	South Fork Wind Farm II	K	Dec-22	40.0	40.0
704	Bear Ridge Solar, LLC	Bear Ridge Solar	A	Dec-22	100.0	100.0
791	Danskammer Energy LLC	Danskammer Energy Center	G	Oct-23	88.9	595.5
276	EDF Renewables Development, Inc.	Homer Solar Energy Center	C	Dec-23	90.0	90.0
668	North Bergen Liberty Generating, LLC	Liberty Generating Alternative	J	Feb-24	1,172.0	1,171.0
737	Equinor Wind US LLC	Empire Wind	J	Dec-24	816.0	816.0
738	Equinor Wind US LLC	Empire Wind II	K	Dec-24	816.0	816.0
778	Astoria Generating Company LP	Gowanus Gas Turbine Facility Repowering	J	May-24	0.0	549.0

Queue	Owner/ Operator	Proposed Generator Project	Zone	Proposed Date*	Requested CRIS (MW)[1]	Summer (MW)
CRIS Requests						
	Innovative Energy Systems, LLC	Fulton County Landfill	F	Oct-20	3.2	N/A
	Seneca Energy II, LLC	Ontario Landfill	B	Oct-20	3.6	N/A
	BSC Owner LLC	Spring Creek Tower	J	Oct-20	8.0	N/A
	Energy Storage Resources, LLC	Eagle Energy Storage	J	Nov-21	20.0	N/A
	Gernonimo Energy, LLC	Blue Stone Solar	G	Jul-21	20.0	N/A
	Energy Storage Resources, LLC	Queen City Energy Storage	K	Sep-21	19.2	N/A
	Strata Storage, LLC	Groundvault Energy Storage	J	Nov-21	12.5	N/A
	Strata Storage, LLC	Stillwell Energy Storage	J	Nov-21	10.0	N/A
	Strata Storage, LLC	Cleancar Energy Storage	J	Nov-21	15.0	N/A
	KCE NY 14, LLC	KCE NY 14	G	Sep-20	20.0	N/A
	Hannacroix Solar Facility, LLC	Hannacroix Solar	G	Oct-20	3.2	N/A
	RWE Solar Development, LLC	Monsey 44-6	G	May-20	5.0	N/A
	RWE Solar Development, LLC	Monsey 44-2	G	May-20	5.0	N/A
	RWE Solar Development, LLC	Monsey 44-3	G	May-20	5.0	N/A
	RWE Solar Development, LLC	Cuddebackville Battery	G	Jan-22	10.0	N/A
	RWE Solar Development, LLC	Jewett Avenue	J	May-22	20.0	N/A
	KCE NY 18, LLC	KCE NY 18	G	Jun-21	20.0	N/A
	Yonkers Grid, LLC	Yonkers Grid	J	Sep-22	20.0	N/A
	King's Plaza Energy LLC	King's Plaza	J	Oct-20	6.0	N/A
	Gravity Renewables, Inc	Dahowa Hydroelectric	F	Oct-20	10.5	N/A
	Enel Green Power North America, Inc.	Cuddebackville	G	May-22	10.0	N/A
734	ELP Ticonderoga Solar, LLC	ELP Ticonderoga Solar	F	May-21	20.0	N/A
741	Bluestone Wind, LLC	Bluestone Battery Storage	E	Aug-20	10.0	N/A
744	Granada Solar LLC	Magruder Solar	G	Dec-20	20.0	N/A
756	Rising Solar, LLC	Rising Solar II	G	Nov-21	20.0	N/A
770	KCE NY 8a LLC	KCE NY 8a	G	May-20	20.0	N/A
804	KCE NY 10, LLC	KCE NY 10	A	Sep-20	20.0	N/A
Future Class Year Candidates						
520	EDP Renewables North America	Rolling Upland Wind	E	Oct-19	72.6	72.6
468	Apex Clean Energy LLC	Galloo Island Wind	C	Dec-19	110.4	110.4
523	Dunkirk Power, LLC	Dunkirk Unit 2	A	Apr-20	75.0	75.0
524	Dunkirk Power, LLC	Dunkirk Unit 3 & 4	A	Apr-20	370.0	370.0
496	Renovo Energy Center, LLC	Renovo Energy Center	C	Jun-20	480.0	480.0
372	Dry Lots Wind, LLC	Dry Lots Wind	E	Dec-20	33.0	33.0
445	Lighthouse Wind, LLC	Lighthouse Wind	A	Dec-20	201.3	201.3
526	Atlantic Wind, LLC	North Ridge Wind	D	Dec-20	100.0	100.0
624	Franklin Solar, LLC	Franklin Solar	D	Dec-20	150.0	150.0
686	Invenergy Solar Development North America LLC	Bull Run Solar Eneryg Center	D	Dec-20	170.0	170.0
693	Renovo Energy Center, LLC	Renovo Energy Center Uprate	C	Apr-21	515.0	515.0
498	ESC Tioga County Power, LLC	Tioga County Power	C	May-21	550.0	550.0
740	Oakdale Battery Storage LLC	Oakdale battery Storage	C	Aug-21	120.0	120.0
474	EDP Renewables North America	North Slope Wind	D	Oct-21	200.0	200.0
466	Atlantic Wind, LLC	Bone Run Wind	A	Dec-21	132.0	132.0
574	Atlantic Wind, LLC	Mad River Wind	E	Dec-21	450.0	450.0
745	Energy Storage Resources, LLC	Huckleberry Ridge Energy	G	Apr-22	100.0	100.0
699	Helix Ravenswood, LLC	Ravenswood Gas	J	Jun-22	238.5	238.5
719	East Ling Energy Center	East Light Energy Center	F	Nov-22	40.0	40.0
497	Invenergy Wind Development LLC	Bull Run	D	Dec-22	303.6	303.6
521	Invenergy NY, LLC	Bull Run II Wind	D	Dec-22	145.4	145.4
449	Stockbridge Wind, LLC	Stockbridge Wind	C	Oct-23	72.6	72.6

Queue	Owner/ Operator	Proposed Generator Project	Zone	Proposed Date*	Requested CRIS (MW)[1]	Summer (MW)
		Other Non Class Year Generators				
775	Puckett Solar, LLC (Conti)	Puckett Solar	E	Apr-20	20.0	20.0
570	Hecate Energy, LLC	Albany County	F	Jun-20	20.0	20.0
598	Hecate Energy, LLC	Albany County II	F	Jun-20	20.0	20.0
581	SED NY Holdings LLC	Hills Solar	E	Jul-20	20.0	20.0
584	SED NY Holdings LLC	Dog Corners Solar	C	Aug-20	20.0	20.0
586	SED NY Holdings LLC	Watkins Rd Solar	E	Aug-20	20.0	20.0
735	ELP Stillwater Solar LLC	ELP Stillwater Solar	F	Aug-20	20.0	20.0
638	Pattersonville Solar Facility, LLC	Pattersonville	F	Oct-20	20.0	20.0
759	KCE NY 6, LLC	KCE NY 6	A	Oct-20	20.0	20.0
590	Duke Energy Renewables Solar, LLC	Scipio Solar	C	Nov-20	20.0	20.0
592	Duke Energy Renewables Solar, LLC	Niagara Solar	B	Nov-20	20.0	20.0
513	Stoney Creek Energy, LLC	Orangeville	C	Dec-20	20.0	20.0
572	Hecate Energy Greene 1 LLC	Greene County 1	G	Dec-20	20.0	20.0
573	Hecate Energy Greene 2 LLC	Greene County 2	G	Dec-20	10.0	10.0
575	Little Pond Solar, LLC	Little Pond Solar	G	Dec-20	20.0	20.0
589	Duke Energy Renewables Solar, LLC	North Country Solar	E	Dec-20	15.0	15.0
621	Blue Stone Solar Energy, LLC	Saugerties Solar	G	Dec-20	20.0	20.0
649	CR Fuel Cell, LLC	Clare Rose	K	Dec-20	13.9	13.9
669	SED NY Holdings LLC	Clay Solar	C	Dec-20	20.0	20.0
670	SED NY Holdings LLC	Skyline Solar	E	Dec-20	20.0	20.0
682	Grissom Solar, LLC	Grissom Solar	F	Dec-20	20.0	20.0
748	Regan Solar, LLC (Conti)	Grissom Solar II	F	Dec-20	20.0	20.0
564	Rock District Solar, LLC	Rock District Solar	F	Apr-21	20.0	20.0
565	Tayandenega Solar, LLC	Tayandenega Solar	F	Apr-21	20.0	20.0
730	Darby Solar, LLC	CS Easton Solar 1	F	Mar-21	20.0	20.0
731	Branscomb Solar, LLC	CS Easton Solar 2	F	Mar-21	20.0	20.0
768	Janis Solar, LLC	Janis Solar	C	Mar-21	20.0	20.0
545	Sky High Solar, LLC	Sky High Solar	C	May-21	20.0	20.0
666	Martin Rd Solar LLC	Martin Solar	A	Oct-21	20.0	20.0
715	EDF Renewables Development, Inc.	Suffragette Solar	C	Nov-21	20.0	20.0
487	LI Energy Storage System, LLC	Far Rockawary Battery Storage	K	Dec-21	20.0	20.0
597	Hecate Energy Greene County 3 LLC	Greene County 3	G	Dec-21	20.0	20.0
650	BRT Fuel Cell, LLC	Brookhaven Rail Terminal	K	May-22	18.5	18.5
667	Bakerstand Solar LLC	Bakerstand Solar	A	Oct-22	20.0	20.0

included in the 2020 RNA Base Case

included in the 2019 - 2028 CRP

* Generation projects that met 2020 RNA Inclusion Rule are assumed to be in-service one year later than 2020 GB Proposed Date to reflect the potential impact of Covid-19 on construction and completion.

Figure 21: Additional Proposed Transmission Projects from the 2020 Gold Book

Queue	Owner	Terminals	
Proposed Merchant Transmission Projects			
506	Empire State Connector Corp.	Marcy 345kV	Gowanus 345kV
631, 15	Transmission Developers Inc.	Hertel 735kV (Quebec)	New Scotland, Astoria Annex 345kV
458,15	Transmission Developers Inc.	Hertel 735kV (Quebec)	Astoria Annex 345kV
Proposed TIP Projects (included in FERC 715 Base Case)			
430	Empire State Connector Corp.	Dennison	Alcoa
545A	NextEra Energy Transmission NY	Dysinger (New Station)	East Stolle (New Station)
545A	NextEra Energy Transmission NY	Dysinger (New Station)	Dysinger (New Station)
556	NGRID	Porter	Rotterdam
556	NGRID	Porter	Rotterdam
556	NGRID	Edic	New Scotland
556	NAT/NYPA/NGRID	Edic	Rotterdam
556	NAT/NYPA	Rotterdam	Princetown
556	NAT/NYPA	Edic	Princetown
556	NAT/NYPA	Princetown	New Scotland
556	NGRID	Princetown	New Scotland
543	NGRID	Greenbush	Hudson
543	NGRID	Hudson	Pleasant Valley
543	NGRID	Schodack	Churchtown
543	NGRID	Churchtown	Pleasant Valley
543	NGRID	Milan	Pleasant Valley
543	NGRID	Lafarge	Pleasant Valley
543	NGRID	North Catskill	Milan
543	O&R	Shoemaker, Middle	Sugarloaf, Chester
543	NGRID	New Scotland	Alps
543	New York Transco	Schodack	Churchtown
543	New York Transco	Churchtown	Pleasant Valley
543	NGRID	Lafarge	Churchtown
543	NGRID	North Catskill	Churchtown
543	New York Transco	Knickerbocker	Pleasant Valley
543	New York Transco	Knickerbocker	Knickerbocker
543	NGRID	Knickerbocker	New Scotland
543	NGRID	Knickerbocker	Alps
543	New York Transco	Shoemaker	Sugarloaf
543	New York Transco	Shoemaker, Middle	Sugarloaf, Chester

included in the 2020 RNA Base Case

included in the 2019 - 2028 CRP

RNA Power Flow Base Case Development

The NYISO developed the 2020 RNA Base Cases used to analyze the performance of the transmission system from the 2020 FERC 715 filing power flow case library. The load representation in the power flow model is the summer peak load forecast reported in the 2020 Gold Book Table 1-3a baseline forecast of coincident peak demand. The system representation for the NPCC Areas in the base cases is from the 2019 Base Case Development libraries compiled by the NPCC SS-37 Base Case Development working group. The NYISO derived the PJM system representation from the PJM Regional Transmission Expansion Plan (RTEP) planning process models. The remaining models are from the Eastern Interconnection Reliability Assessment Group (ERAG) Multiregional Modeling Working Group (MMWG) 2019 power flow model library.

The NYISO utilized the RNA Base Case inclusion rules to screen the projects and plans for inclusion or exclusion from the 2020 RNA Base Case. The NYISO revised the RNA Base Case inclusion rules as set forth in Section 3 of the Reliability Planning Process Manual (Manual 26).

Specifically, the 2020 RNA Base Case does not include all projects currently listed on the NYISO's interconnection queue or those shown in the 2020 Gold Book. Rather, it includes only those which met the screening requirements, as shown in the Figure 18 of the main report. The generation deactivation assumptions are reflected in Figure19 and Figure 20 of the main report. The firm transmission plans included in the RNA Base Case are listed in Figure 22 on the next page.

Figure 22: Firm Transmission Plans included in 2020 RNA Base Case

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
Firm Plans (5) (included in FERC 715 Base Case)											
ConEd	Jamaica	Jamaica	Reconfiguration	In-Service	2019	138	138		N/A	N/A	Reconfiguration
ConEd	East 13th Street	East 13th Street	xfmr	In-Service	2019	345	345		N/A	N/A	Replacing xfmr 10 and xfmr 11
ConEd	Gowanus	Gowanus	xfmr	In-Service	2019	345	345		N/A	N/A	Replacing xfmr T2
ConEd	East 13th Street	East 13th Street	Reconfiguration	In-Service	2019	345	345		N/A	N/A	Reconfiguration (xfmr 10 -xfmr 11)
ConEd	Rainey	Corona	xfmr/Phase shifter	In-Service	2019	345/138	345/138	1	268 MVA	320 MVA	xfmr/Phase shifter
LIPA	Far Rockaway	Far Rockaway	Reconfiguration	In-Service	2019	34.5	34.5		N/A	N/A	Reconfigure 34.5 kV switchgear
LIPA	Elwood	Elwood	Breaker	In-Service	2019	138	138		N/A	N/A	Install double bus tie - Operate Normally Open
LIPA	Canal	Southampton	5.20	In-Service	2019	69	69	1	1107	1169	2500 kcmil XLPE CU
LIPA	Deer Park	Deer Park	-	W	2019	69	69	1	N/A	N/A	Install 27 MVAR Cap Bank
LIPA	MacArthur	MacArthur	-	W	2019	69	69	1	N/A	N/A	Install 27 MVAR Cap Bank
LIPA	West Hempstead	East Garden City	-2.92	In-Service	2019	69	69	1	1158	1245	477 ACSS
LIPA	West Hempstead	Hempstead	0.97	In-Service	2019	69	69	1	1158	1245	477 ACSS
LIPA	Hempstead	East Garden City	1.95	In-Service	2019	69	69	1	1158	1245	477 ACSS
LIPA	Pilgrim	West Bus	-11.86	In-Service	2019	138	138	1	2087	2565	2493 ACAR
LIPA	West Bus	Kings	8.25	In-Service	2019	138	138	1	2087	2565	2493 ACAR
LIPA	Pilgrim	Kings	4.81	In-Service	2019	138	138	1	2087	2565	2493 ACAR
NGRID	Golah	Golah	Cap Bank	In-Service	2019	115	115	1	18MVAR	18MVAR	Capacitor Bank
NGRID	Falls Park	Schodack(NG)	17.33	In-Service	2019	115	115	1	186 MVA	227 MVA	Loop for NYSEG Sub Will Reconfigure NG Line #14 Into Two New Lines
NGRID	Falls Park	Churchtown	9.41	In-Service	2019	115	115	1	175 MVA	206 MVA	Loop for NYSEG Sub Will Reconfigure NG Line #14 Into Two New Lines

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
NGRID	Batavia	Batavia	Cap Bank	In-Service	2019	115	115	1	30MVAR	30MVAR	Second Capacitor Bank
NGRID	Battenkill	Eastover Road	-22.72	In-Service	2019	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Battenkill	Schaghticoke (New Station)	14.31	In-Service	2019	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Schaghticoke (New Station)	Eastover Road	8.41	In-Service	2019	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Mohican	Luther Forest	-34.47	In-Service	2019	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Mohican	Schaghticoke (New Station)	28.13	In-Service	2019	115	115	1	937	1141	New Schaghticoke Switching Station
NGRID	Ohio St	Ohio St		In-Service	2019	115	115		N/A	N/A	New Distribution Station at Ohio Street
NGRID	Albany Steam	Greenbush	6.14	In-Service	2019	115	115	2	1190	1527	Reconductor Albany - Greenbush 115kV lines 1 & 2
NGRID	Schodack	Churchtown	-26.74	In-Service	2019	115	115	1	937	1141	Line removal tapped by Falls Park Project
NGRID	Sodeman Rd	Sodeman Rd		In-Service	2019	115	115		N/A	N/A	New Distribution Station at Sodeman Road
NGRID	Dewitt	Dewitt		In-Service	2019	115	115		N/A	N/A	New Distribution Station at Dewitt
NGRID	Luther Forest	Schaghticoke (New Station)	6.34	In-Service	2019	115	115	1	1280	1563	New Schaghticoke Switching Station
NGRID	Seneca	Seneca	-	In-Service	2019	115/22	115/22	-	50MVA	50MVA	Damage/Failure on TR2
NGRID	Mortimer	Mortimer	Reconfiguration	In-Service	2019	115	115	1	N/A	N/A	Reconfiguration of Station
NGRID	Mohican	Butler	3.50	S	2019	115	115	1	TBD	TBD	Replace 3.5 miles of conductor w/min 336.4 ACSR
NYSEG	Wood Street	Carmel	1.34	In-Service	2019	115	115	1	261 MVA	261 MVA	477 ACSR
NYSEG	Flat Street	Flat Street	xfmr	In-Service	2019	115/34.5	115/34.5	2	40MVA	45.2MVA	Transformer #2
NYSEG	Falls Park 115/34.5kV			In-Service	2019	115/34.5	115/34.5				Tap to interconnect NG Line #14
NYSEG	Falls Park	Falls Park	xfmr	In-Service	2019	115/34.5	115/34.5	1	62 MVA	70 MVA	Transformer #1

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
RGE	Station 42	Station 23	Phase Shifter	In-Service	2019	115	115	1	253 MVA	253 MVA	Phase Shifter
RGE	Station 23	Station 23	xfmr	In-Service	2019	115/11.5/11.5	115/11.5/11.5	2	75 MVA	84 MVA	Transformer
RGE	Station 23	Station 23	xfmr	W	2019	115/34.5	115/34.5	2	75 MVA	84 MVA	Transformer
CHGE	North Chelsea	North Chelsea	xfmr	S	2020	115/69	115/69	1	564	728	Replace Transformer 1
CHGE	Fishkill Plains	East Fishkill	2.05	S	2020	115	115	1	995	1218	1-1033.5 ACSR
CHGE	North Catskill	North Catskill	xfmr	W	2020	115/69	115/69	2	560	726	Replace Transformer 4 & 5
ConEd	Buchanan North	Buchanan North	Reconfiguration	S	2020	345	345		N/A	N/A	Reconfiguration (bus work related to decommissioning of Indain Point 2)
LIPA	Meadowbrook	East Garden City	-3.11	S	2020	69	69	1	458	601	4/0 CU
LIPA	East Garden City	Lindbergh	2.50	S	2020	69	69	1	575	601	750 kcmil CU
LIPA	Lindbergh	Meadowbrook	2.11	S	2020	69	69	1	458	601	4/0 CU
LIPA	Elmont	Floral Park	-1.59	S	2020	34.5	34.5	1	644	816	477 AL
LIPA	Elmont	Belmont	1.82	S	2020	34.5	34.5	1	342	457	2/0 CU
LIPA	Belmont	Floral Park	2.04	S	2020	34.5	34.5	1	644	816	477 AL
LIPA	MacArthur	-	Cap Bank	S	2020	69	69	1	27MVAR	27 MVAR	Capacitor bank
NGRID	Rosa Rd	Rosa Rd	-	S	2020	115	115		N/A	N/A	Install 35.2MVAR Cap Bank at Rosa Rd
NGRID	Rotterdam	Curry Rd	7	S	2020	115	115	1	808	856	Replace 7.0 miles of mainly 4/0 Cu conductor with 795kcmil ACSR 26/7
NGRID	Elm St	Elm St	xfmr	S	2020	230/23	230/23	1	118MVA	133MVA	Add a fourth 230/23kV transformer
NGRID	West Ashville	West Ashville		S	2020	115	115		N/A	N/A	New Distribution Station at West Ashville
NGRID	Spier	Rotterdam (#2)	-32.74	S	2020	115	115	1	1168	1416	New Lasher Rd Switching Station
NGRID	Spier	Lasher Rd (New Station)	21.69	S	2020	115	115	1	1168	1416	New Lasher Rd Switching Station

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
NGRID	Lasher Rd (New Station)	Rotterdam	11.05	S	2020	115	115	1	2080	2392	New Lasher Rd Switching Station
NGRID	Spier	Luther Forest (#302)	-34.21	S	2020	115	115	1	916	1070	New Lasher Rd Switching Station
NGRID	Spier	Lasher Rd (New Station)	21.72	S	2020	115	115	1	916	1118	New Lasher Rd Switching Station
NGRID	Lasher Rd (New Station)	Luther Forest	12.49	S	2020	115	115	1	990	1070	New Lasher Rd Switching Station
NGRID	Rotterdam	Rotterdam	-	S	2020	115	115	2	N/A	N/A	Install Series Reactors at Rotterdam Station on lines 17 & 19
NGRID	Huntley	Lockport	6.9	S	2020	115	115	2	1303	1380	Replace 6.9 miles of 36 and 37 lines
NGRID	Two Mile Creek	Two Mile Creek		S	2020	115	115		N/A	N/A	New Distribution Station at Two Mile Creek
NGRID	Maple Ave	Maple Ave		S	2020	115	115		N/A	N/A	New Distribution Station at Maple Ave
NGRID	Randall Rd	Randall Rd		S	2020	115	115		N/A	N/A	New Distribution Station at Randall Road
NGRID	GE	Geres Lock	7.14	S	2020	115	115	1	785	955	Reconductoring 4/0CU & 336 ACSR to 477 ACCR (Line #8)
NGRID	Gardenville 115kV	Gardenville 115kV	-	S	2020	-	-	-	-	-	Rebuild of Gardenville 115kV Station to full breaker and a half
NGRID	Rotterdam	Woodlawn	7	S	2020	115	115	1			Replace 7.0 miles of mainly 4/0 Cu conductor with 795kcmil ACSR 26/7
NGRID	Gardenville 230kV	Gardenville 115kV	xfmr	S	2020	230/115	230/115	-	347 MVA	422 MVA	Replacement of 230/115kV TB#4 stepdown with larger unit
NGRID	Oswego	Oswego	-	W	2020	115	115		N/A	N/A	Rebuild of Oswego 115kV Station
NYPA	Fraser Annex	Fraser Annex	SSR Detection	S	2020	345	345	1	1793 MVA	1793 MVA	MSSC SSR Detection Project
NYPA	Niagara	Rochester	-70.20	W	2020	345	345	1	2177	2662	2-795 ACSR
NYPA	Somerset	Rochester	-44.00	W	2020	345	345	1	2177	2662	2-795 ACSR
NYPA	Niagara	Station 255 (New Station)	66.40	W	2020	345	345	1	2177	2662	2-795 ACSR
NYPA	Somerset	Station 255 (New Station)	40.20	W	2020	345	345	1	2177	2662	2-795 ACSR
NYPA	Station 255 (New Station)	Rochester	3.80	W	2020	345	345	2	2177	2662	2-795 ACSR

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
NYPA	Niagara 230 kV	Niagara 230 kV	Breaker	W	2020	230	230	1	N/A	N/A	Add a new breaker
NYPA	Niagara 230 kV	Niagara 115 kV	Autotransformer	S	2020	230	115	1	240 MVA	240 MVA	Replace Niagara AT #1
NYPA	Astoria 138 kV	Astoria 13.8 kV	Astoria CC GSU Refurbishment	W	2020	138	18	1	234	234	Astoria CC GSU Refurbishment
NYSEG	Watercure Road	Watercure Road	xfmr	W	2020	345/230	345/230	1	426 MVA	494 MVA	Transformer #2 and Station Reconfiguration
NYSEG	Willet	Willet	xfmr	W	2020	115/34.5	115/34.5	1	39 MVA	44 MVA	Transformer #2
NYSEG	Coddington	E. Ithaca (to Coddington)	8.07	W	2020	115	115	1	307 MVA	307 MVA	665 ACCR
O & R	West Nyack	West Nyack	Cap Bank	S	2020	138	138	1	-	-	Capacitor Bank
O & R	Harings Corner (RECO)	Closter (RECO)	3.20	S	2020	69	69	1	1098	1312	UG Cable
O & R	Ramapo	Ramapo	xfmr	S	2020	345/138	345/138	1	731	731	-
RGE	Station 122-Pannell-PC1	Station 122-Pannell-PC1		S	2020	345	345	1	1314 MVA-LTE	1314 MVA-LTE	Relay Replacement
RGE	Station 262	Station 23	1.46	W	2020	115	115	1	2008	2008	Underground Cable
RGE	Station 33	Station 262	2.97	W	2020	115	115	1	2008	2008	Underground Cable
RGE	Station 262	Station 262	xfmr	W	2020	115/34.5	115/34.5	1	58.8MVA	58.8MVA	Transformer
RGE	Station 255 (New Station)	Rochester	3.80	W	2020	345	345	1	2177	2662	2-795 ACSR
RGE	Station 255 (New Station)	Station 255 (New Station)	xfmr	W	2020	345/115	345/115	1	400 MVA	450 MVA	Transformer
RGE	Station 255 (New Station)	Station 255 (New Station)	xfmr	W	2020	345/115	345/115	2	400 MVA	450 MVA	Transformer
RGE	Station 255 (New Station)	Station 418	9.60	W	2020	115	115	1	1506	1807	New 115kV Line
RGE	Station 255 (New Station)	Station 23	11.10	W	2020	115	115	1	1506	1807	New 115kV Line
CHGE	Hurley Avenue	Leeds	Static synchronous	S	2021	345	345	1	2336	2866	21% Compensation
LIPA	Valley Stream	East Garden City	7.36	S	2021	138	138	1	1171	1171	2000 SQMM XLPE

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
LIPA	Amagansett	Montauk	-13.00	S	2021	23	23	1	577	657	750 kcmil CU
LIPA	Amagansett	Navy Road	12.74	S	2021	23	23	1	577	657	750 kcmil CU
LIPA	Navy Road	Montauk	0.26	S	2021	23	23	1	577	657	750 kcmil CU
LIPA	Riverhead	Wildwood	10.63	S	2021	138	138	1	1399	1709	1192ACSR
LIPA	Riverhead	Canal	16.49	S	2021	138	138	1	1000	1110	2368 KCMIL (1200 mm²) Copper XLPE
LIPA	Deer Park	-	Cap Bank	S	2021	69	69	1	27MVAR	27 MVAR	Capacitor bank
NGRID	Clay	Dewitt	10.24	S	2021	115	115	1	220MVA	268MVA	Reconductor 4/0 CU to 795ACSR
NGRID	Clay	Teall	12.75	S	2021	115	115	1	220 MVA	268MVA	Reconductor 4/0 CU to 795ACSR
NGRID	Gardenville 230kV	Gardenville 115kV	xfmr	S	2021	230/115	230/115	-	347 MVA	422 MVA	Replacement of 230/115kV TB#3 stepdown with larger unit
NGRID	Huntley 115kV	Huntley 115kV	-	S	2021	230	230	-	N/A	N/A	Rebuild of Huntley 115kV Station
NGRID	Mortimer	Mortimer	xfmr	S	2021	115	115		50MVA	50MVA	Replace Mortimer 115/69kV Transformer
NGRID	Mortimer	Mortimer	-	S	2021	115	115		N/A	N/A	Second 115kV Bus Tie Breaker at Mortimer Station
NGRID	New Bethlehem	New Bethlehem	-	S	2021	115	115		N/A	N/A	New Bethlehem 115/13.2kV station
NGRID	New Cicero	New Cicero		S	2021	115	115		N/A	N/A	New Distribution Station at New Cicero
NGRID	Mountain	Lockport	0.08	S	2021	115	115	2	174MVA	199MVA	Mountain-Lockport 103/104 Bypass
NGRID	Royal Ave	Royal Ave	-	S	2021	115/13.2	115/13.2	-	-	-	Install new 115-13.2 kV distribution substation in Niagara Falls (Royal Ave)
NGRID	Niagara	Packard	3.4	W	2021	115	115	1	344MVA	449MVA	Replace 3.4 miles of 192 line
NYPA	Moses 230 kV	Adirondack 230 kV	Series Compensation	S	2021	230	230	-	±13.2kV	±13.2kV	Voltage Source Series Compensation
NYPA	St. Lawrence 230kV	St. Lawrence 115kV	xfmr	S	2021	230/115	230/115	1	TBD	TBD	Replacement of St. Lawrence AutoTransformer #2
NYPA	Plattsburg 230 kV	Plattsburg 115 kV	xfmr	W	2021	230/115	230/115	1	249	288	Refurbishment of Plattsburgh Auto Transformer #1

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
NYPA	Astoria Annex	Astoria Annex	Shunt Reactor	W	2021	345	345	2	TBD	TBD	
O & R	Lovett 345 kV Station (New	Lovett	xfmr	S	2021	345/138	345/138	1	562 MVA	562 MVA	Transformer
O & R	Little Tor	-	Cap Bank	S	2021	138	138	1	32 MVAR	32 MVAR	Capacitor bank
O & R	Deerpak	Port Jervis	2	S	2021	69	69	1		1604	
O & R	Westtown	Port Jervis	7	S	2021	69	69	1		1604	
O & R/ConEd	Ladentown	Buchanan	-9.5	S	2021	345	345	1	3000	3211	2-2493 ACAR
O & R/ConEd	Ladentown	Lovett 345 kV Station (New	5.5	S	2021	345	345	1	3000	3211	2-2493 ACAR
O & R/ConEd	Lovett 345 kV Station (New	Buchanan	4	S	2021	345	345	1	3000	3211	2-2493 ACAR
CHGE	St. Pool	High Falls	5.61	W	2022	115	115	1	1010	1245	1-795 ACSR
CHGE	High Falls	Kerhonkson	10.03	W	2022	115	115	1	1010	1245	1-795 ACSR
CHGE	Modena	Galeville	4.62	W	2022	115	115	1	1010	1245	1-795 ACSR
CHGE	Galeville	Kerhonkson	8.96	W	2022	115	115	1	1010	1245	1-795 ACSR
CHGE	Hurley Ave	Saugerties	11.40	W	2022	69	115	1	1114	1359	1-795 ACSR
CHGE	Kerhonkson	Kerhonkson	xfmr	W	2022	115/69	115/69	1	564	728	Add Transformer 3
CHGE	Kerhonkson	Kerhonkson	xfmr	W	2022	115/69	115/69	1	564	728	Add Transformer 4
CHGE	Rock Tavern	Sugarloaf	12.10	W	2022	115	115	1	N/A	N/A	Retire SL Line
CHGE	Sugarloaf	NY/NJ State Line	10.30	W	2022	115	115	2	N/A	N/A	Retire SD/SJ Lines
NGRID	South Oswego	Indeck (#6)	-	S	2022	115	115	1	-	-	Install High Speed Clearing on Line #6
NGRID	Porter	Porter	-	S	2022	230	230		N/A	N/A	Porter 230kV upgrades
NGRID	Watertown	Watertown		S	2022	115	115		N/A	N/A	New Distribution Station at Watertown

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
NGRID	Golah	Golah	xfmr	S	2022	69	69		50MVA	50MVA	Replace Golah 69/34.5kV Transformer
NGRID	Niagara	Packard	3.7	S	2022	115	115	1	344MVA	449MVA	Replace 3.7 miles of 191 line
NGRID	Lockport	Mortimer	56.5	S	2022	115	115	3	-	-	Replace Cables Lockport-Mortimer #111, 113, 114
NGRID	Niagara	Packard	3.7	W	2022	115	115	2	344MVA	449MVA	Replace 3.7 miles of 193 and 194 lines
NGRID	Gardenville	Big Tree	6.3	W	2022	115	115	1	221MVA	221MVA	Gardenville-Arcade #151 Loop-in-and-out of NYSEG Big Tree
NGRID	Big Tree	Arcade	28.6	W	2022	115	115	1	129MVA	156MVA	Gardenville-Arcade #151 Loop-in-and-out of NYSEG Big Tree
NGRID	Coffeen	Coffeen	-	S	2022	115	115	-	TBD	TBD	Terminal equipment replacements
NGRID	Browns Falls	Browns Falls	-	S	2022	115	115	-	TBD	TBD	Terminal equipment replacements
NGRID	Taylorville	Taylorville	-	S	2022	115	115	-	TBD	TBD	Terminal equipment replacements
NYPA	Niagara 345 kV	Niagara 230 kV	xfmr	W	2022	345/230	345/230	1	TBD	TBD	Replacement of Niagara AutoTransformer #3
NYSEG	South Perry	South Perry	xfmr	W	2022	115/34.5	115/34.5	1	59 MVA	67 MVA	Transformer #3
NYSEG	South Perry	South Perry	xfmr	W	2022	230/115	230/115	1	246 MVA	291 MVA	Transformer
NYSEG	Fraser	Fraser	xfmr	W	2022	345/115	345/115	1	305 MVA	364 MVA	Transformer #2 and Station Reconfiguration
NYSEG	Fraser 115	Fraser 115	Rebuild	W	2022	115	115		N/A	N/A	Station Rebuild to 4 bay BAAH
NYSEG	Delhi	Delhi	Removal	W	2022	115	115		N/A	N/A	Remove 115 substation and terminate existing lines to Fraser 115 (short distance)
NYSEG	Erie Street Rebuild	Erie Street Rebuild	Rebuild	W	2022	115	115				Station Rebuild
NYSEG	Big Tree Road	Big Tree Road	Rebuild	W	2022	115	115				Station Rebuild
NYSEG	Meyer	Meyer	xfmr	W	2022	115/34.5	115/34.5	2	59.2MVA	66.9MVA	Transformer #2
O & R	Ramapo (NY)	South Mahwah	5.50	W	2022	138	138	2	1980	2120	1272 ACSS
RGE	Station 168	Mortimer (NG Trunk #2)	26.4	W	2022	115	115	1	145 MVA	176 MVA	Station 168 Reinforcement Project

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
RGE	Station 168	Elbridge (NG Trunk # 6)	45.5	W	2022	115	115	1	145 MVA	176 MVA	Station 168 Reinforcement Project
RGE	Station 127	Station 127	xfmr	W	2022	115/34.5	115/34.5	1	75MVA	75MVA	Transformer #2
CHGE	Saugerties	North Catskill	12.46	W	2023	69	115	1	1114	1359	1-795 ACSR
NGRID	Cortland	Clarks Corners	0.2	S	2023	115	115	1	147MVA	170MVA	Replace 0.2 miles of 1(716) line and series equipment
NGRID	Maplewood	Menands	3	S	2023	115	115	1	220 MVA	239 MVA	Reconductor approx 3 miles of 115kV Maplewood – Menands #19
NGRID	Maplewood	Reynolds	3	S	2023	115	115	1	217 MVA	265 MVA	Reconductor approx 3 miles of 115kV Maplewood – Reynolds Road #31
NGRID	Elm St	Elm St	-	S	2023	230/23	230/23	-	118MVA	133MVA	Replace TR2 as failure
NGRID	Packard	Huntley	9.1	W	2023	115	115	1	262MVA	275MVA	Walck-Huntley #133, Packard-Huntley #130 Reconductor
NGRID	Walck	Huntley	9.1	W	2023	115	115	1	262MVA	275MVA	Walck-Huntley #133, Packard-Huntley #130 Reconductor
NGRID	Kensington Terminal	Kensington Terminal	-	W	2023	115/23	115/23	-	50MVA	50MVA	Replace TR4 and TR5
NGRID	Malone	Malone	-	S	2023	115	115	-	TBD	TBD	Station Rebuild
NGRID	Taylorville	Boonville	-	S	2023	115	115	-	TBD	TBD	Install series reactors on the 5 and 6 lines. Size TBD
NYPA	Moses	Adirondack	78	S	2023	230	345	2	1088	1329	Replace 78 miles of both Moses-Adirondack 1&2
NYPA	Niagara 345 kV	Niagara 230 kV	xfmr	W	2023	345/230	345/230	1	TBD	TBD	Replacement of Niagara AutoTransformer #5
NYSEG	Gardenville	Gardenville	xfmr	W	2023	230/115	230/115	1	316 MVA	370 MVA	NYSEG Transformer #3 and Station Reconfiguration
NYSEG	Wood Street	Wood Street	xfmr	W	2023	345/115	345/115	1	327 MVA	378 MVA	Transformer #3
O & R	Burns	West Nyack	5.00	S	2023	138	138	1	940	940	UG Cable
O & R	Shoemaker	Pocatello	2.00	W	2023	69	69	1	1604	1723	795 ACSS
O & R	Sugarloaf	Shoemaker	12.00	W	2023	69	138	2	1062	1141	397 ACSS
ConEd	Hudson Ave East	New Vinegar Hill	xfmrs/PARs/Feeders	S	2024	138/27	138/27		N/A	N/A	New Hudson Ave Distribution Switching Station

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
ConEd	Farragut	Farragut	Reconfiguration	S	2024	138	138		N/A	N/A	Install PASS Breaker
NGRID	Dunkirk	Laona	-	S	2024	115	115	2	N/A	N/A	Remove series reactors from New Road Switch Station and install new to Moons Switch Station
NGRID	Laona	Moons	-	S	2024	115	115	2	N/A	N/A	Remove series reactors from New Road Switch Station and install new to Moons Switch Station
NGRID	Golah	Golah	Reconfiguration	S	2024	115	115		-	-	Add a Golah 115kV bus tie breaker
NGRID	Dunkirk	Dunkirk	-	S	2024	115	115		N/A	N/A	Rebuild of Dunkirk 115kV Station
NGRID	Gardenville	Dunkirk	20.5	S	2024	115	115	2	1105	1346	Replace 20.5 miles of 141 and 142 lines
NGRID	Homer Hill	Homer Hill	-	S	2024	115	115	-	116MVA	141MVA	Homer Hill Replace five OCB
NGRID	Inghams	Saint Johnsville	2.94	W	2024	115	115	1	1114	1359	Reconductor 2.94mi of 2/0 + 4/0 Cu (of 7.11mi total) to 795 ACSR
NGRID	Inghams 115kV	Inghams 115kV	Breaker	W	2024	115	115	-	2000	2000	Add series breaker to Inghams R15 (Inghams - Meco #15 115kV)
NGRID	Schenectady International	Rotterdam	0.93	W	2024	69	115	1	1114	1359	Reconductor 0.93mi of 4/0 Cu + 336.4 ACSR (of 21.08mi total) to 795 ACSR
NGRID	Rotterdam	Schoharie	0.93	W	2024	69	115	1	1114	1359	Reconductor 0.93mi of 4/0 Cu (of 21.08mi total) to 795 ACSR
NYSEG	Westover 115	Westover	Removal	W	2024	115	115		N/A	N/A	Remove 115 substation and terminate existing lines to Oakdale 115 (short distance)
O & R	Montvale (RECO)	-	Cap Bank	S	2024	69	69	1	32 MVAR	32 MVAR	Capacitor bank
O & R	Ramapo	Sugarloaf	17.00	W	2024	138	138	1	1980	2120	1272 ACSS
O & R	Burns	Corporate Drive	5.00	W	2024	138	138	1	1980	2120	1272 ACSS
RGE	Station 418	Station 48	7.6	W	2024	115	115	1	175 MVA	225 MVA	New 115kV Line
RGE	Station 82	Station 251 (Upgrade Line		W	2024	115	115	1	400MVA	400MVA	Line Upgrade
RGE	Mortimer	Station 251 (Upgrade Line	1.00	W	2024	115	115	1	400MVA	400MVA	Line Upgrade
LIPA	Southampton	Deerfield	4.00	S	2025	69	138	1	1171	1171	2000 SQMM XLPE
NGRID	Stoner	Rotterdam	9.81	W	2025	115	115	1	1398	1708	Reconductor 9.81mi of 4/0 Cu + 336.4 ACSR (of 23.12mi total) to 1192.5 ACSR

Transmission Owner	Terminals		Line Length in Miles	In-Service Date/Yr		Nominal Voltage in kV		# of ckts	Thermal Ratings (4)		Project Description / Conductor Size
				Prior to (2)	Year	Operating	Design		Summer	Winter	
NGRID	Meco	Rotterdam	9.81	W	2025	115	115	1	1398	1708	Reconductor 9.96mi of 4/0 Cu + 336.4 ACSR (of 30.79mi total) to 1192.5 ACSR
LIPA	Syosset	Shore Rd	11.00	S	2026	138	138	1	1171	1171	2000 SQMM XLPE
LIPA	Syosset	Shore Rd	Phase Shifter	S	2026	138	138	1	TBD	TBD	Phase Shifter
NGRID	Niagara	Gardenville	26.3	S	2026	115	115	1	275MVA	350MVA	Packard-Erie / Niagara-Garenville Reconfiguration
NGRID	Packard	Gardenville	28.2	S	2026	115	115	2	168MVA	211 MVA	Packard-Gardenville Reactors, Packard-Erie / Niagara-Garenville Reconfiguration
NGRID	Mortimer	Pannell	15.7	S	2026	115	115	2	221MVA	270MVA	
NGRID/NYSEG	Erie St	Gardenville	5.5	S	2026	115	115	1	139MVA	179MVA	Packard-Erie / Niagara-Garenville Reconfiguration, Gardenville add breakers
O & R	West Nyack	West Nyack	-	S	2026	138	138	1			Station Reconfiguration
O & R	West Nyack (NY)	Harings Corner (RECO)	7.00	W	2026	69	138	1	1604	1723	795 ACSS

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2020 RNA MARS Model Base Case Development

The NYISO developed the system representations for PJM, Ontario, New England, and Hydro Quebec modeled in the 2020 RNA Base Case from the NPCC CP-8 2020 Summer Assessment. To avoid overdependence on emergency assistance from the external areas, the emergency operating procedure data was removed from the model for each external area. In addition, the capacity of the external areas was further modified such that the LOLE value of each external area was a minimum value of 0.10 and capped at a value of 0.15 throughout Study Period.

The topology used in the MARS model RNA Base Case is located in Figures 28 to 30 in the body of the report. The internal transfer limits modeled are the summer emergency ratings derived from the RNA power flow cases discussed above. The NYISO developed external transfer limits from the NPCC CP-8 Summer Assessment MARS database with changes based upon the RNA Base Case assumptions.

Emergency Thermal Transfer Limit Analysis for Resource Adequacy Assessments

The NYISO performed analyses of the RNA Base Cases to determine emergency thermal transfer limits for the key interfaces used in the MARS resource adequacy analysis. Figure 23 below reports the emergency thermal transfer limits for the RNA base system conditions.

Figure 23: Emergency Thermal Transfer Limits (MW)

Interface	2025	
Dysinger East	2200	1
Moses South	2650	2
Central East MARS	4925	3
F to G	5400	3
I to J	4350	4
I to K (Y49/Y50)	1293	5

	Limiting Facility	Rating	Contingency
1	Niagara - Dysinger 345 kV	1685	Niagara - Dysinger 345 kV
2	Chases Lake - Porter 230 KV	516	Chateaugay - Massena - Marcy 765 kV
3	New Scotland - Knickerbocker 345 kV	1423	Pre-disturbance
4	Mott Haven - Rainey 345 kV	785	Pre-disturbance
5	Dunwoodie - Shore Rd. 345 kV	653	Pre-disturbance

Figure 24: Dynamic Limit Tables (MW)

Year	Interface	Oswego Complex Units*					
		All available	Any 1 out	Any 2 out	Any 3 out	Any 4 out	Any 5 (or more) out
2021 - 2023	Central East MARS	3100	3050	2990	2885	2770	2645
	Central East Group	5000	4925	4840	4685	4510	4310
2024 - 2030	Central East MARS	3925	3875	3815	3710	3595	3470
	Central East Group	5650	5575	5490	5335	5160	4960

* 9 Mile Point 1, 9 Mile Point 2, FitzPatrick, Oswego 5, Oswego 6, Independence (Modeled as one unit in MARS)

Year	Interface	Barrett Steam units (1 and 2)		
		Both available	Any 1 out	Both out
All	Con Ed-LIPA (towards Zone J)	220	200	130

Year	Interface	Northport Steam 1 - 4	
		All available	Any out
All	Norwalk CT to Zone K (NNC)	260	404

Year	Interface	Arthur Kill 2, Arthur Kill 3, Linden Cogen			
		All available	Any AK 2 or Linden out	AK 3 out	Any 2 out
All	A Line & VFT (towards Zone J)	200	500	700	815

Year	Interface	CPV Valley units		
		Both available	Any 1 out	Both out
2021 - 2023	E to G (Marcy South)	1750	2000	2250

Year	UPNYSNY Limit (MW)	Units Available		
		CPV Valley	Cricket Valley	Athens
2021- 2023	5250	2	3	3
	5100	2	3	2
	5350	1	3	3
	5200	2	2	3
	5150	2	1	3
	5250	1	1	3
	5100	2	0	3
	5350	All other conditions		

The method for modeling the UPNY-SENY interface in the MARS topology was changed for the 2020 RNA. However, the changes apply to years 2021 through 2023, which are not included in the 2020 RNA study period. Beginning in year 2024, the UPNY-SENY interface is modeled as a single limit because of the large increases in transfer capability resulting from addition of the AC Transmission projects.

In the 2018 RNA MARS topology, the UPNY-SENY interface was modeled in a non-standard way because of limitations of the MARS program. For study years 2021 through 2023 in the 2018 RNA, a fictitious interface (UPNYSNY2) was modeled that included the generation output from the Cricket Valley and CPV Valley plants. A set of dynamic limit tables was applied to UPNYSNY2 to control the flow across the traditional UPNY-SENY interface. This modeled required having the Cricket Valley and the CPV Valley plants in their own MARS areas separate from Zone G. The MARS program was subsequently updated to simplify the model for the 2020 RNA. With these program updates, the interface limits can simply be applied to the traditional UPNY-SENY MARS interface, which eliminates the need to define the fictitious interface. It also allows the two plants to be modeled directly in Zone G, which avoids MARS treating them differently than the other units in Zone G. The UPNYSNY2 limits were replaced with UPNY-SENY MARS limits for the 2020 RNA, as shown in Figure 25.

Figure 25: 2018 RNA and 2020 RNA UPNYSNY Dynamic Limit Table

Year	2020 RNA	2018 RNA	Units Available		
	UPNY-SENY MARS Limit	UPNYSNY2 Limit	CPV Valley	Cricket Valley	Athens
2021- 2023	5250	6950	2	3	3
	5100	6750	2	3	2
	5350	6700	1	3	3
	5200	6550	2	2	3
	5150	6150	2	1	3
	5250	5950	1	1	3
	5100	5800	2	0	3
	5350	6600	All other conditions		

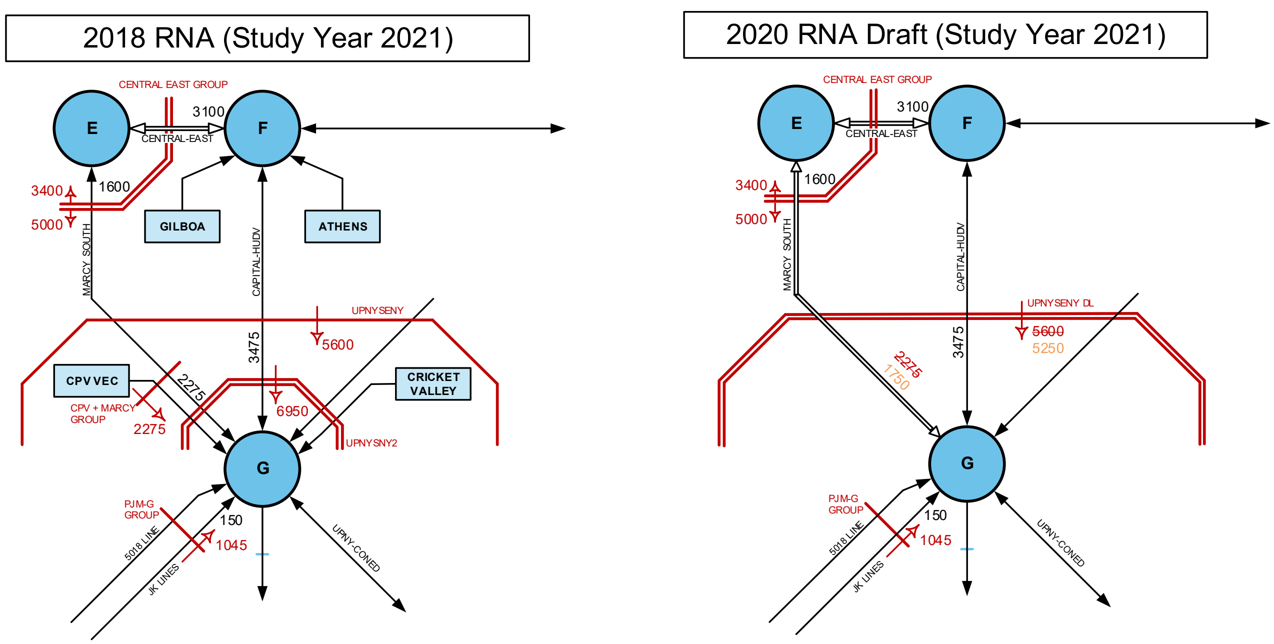
The E to G (Marcy South) interface was also updated for the 2020 RNA. In the 2018 RNA, a joint interface, CPV + Marcy Group, was utilized to capture the impact of the CPV Valley plant on the E to G interface. A flow calculation on the joint interface effectively reduced the limit on E to G by 90% of the CPV Valley plant output. For the 2020 RNA, this model was replaced with a DLT model applied to the E to G interface as shown in Figure 26. The joint interface and flow calculation were removed and the CPV Valley units were modeled directly in Zone G instead of as a separate MARS area.

Figure 26: E to G Dynamic Limit Table

E to G	CPV Valley
1750	2
2000	1
2250	0

The modeling changes resulted in flows and LOLE results that were extremely close when the models were tested and compared. The new simplified models are more straightforward to implement, maintain and verify in the MARS database.

Figure 27: UPNYSNY Topology Diagram in 2018 RNA and 2020 RNA



Additional "Free Flow" MARS Simulations Observations

To determine if transmission reinforcements would be beneficial, a "NYCA free flow" test was executed, with results in the body of the report. A "free flow" simulation is one in which NYCA LOLEs are determined without considering any transmission transfer limitations within the NYCA system. This provides an indication of whether any LOLE violations identified are purely resource related or if they are caused by limitations in the transmission system.

When removing the NYCA internal limits, the NYCA LOLE decreased to below the criterion level throughout the Study Period, indicating that there is no statewide resource deficiency. It also showed that transmission reinforcement, which would provide an injection into Zone J where the deficiency is located, is a potential option to resolve the identified resource adequacy Reliability Need.

Additional topology limits variations were performed to identify which specific interface transfer capability increases help the most, and to provide additional insights. The table below summarizes those simulations.

Figure 28: Free Flow Variations Results and Observations

Case	2030 NYCA LOLE (days/year)	Notes
Base Case	0.187	I to J (Dunwoodie South) at 4350 MW G to H (UPNY-ConEd) at 7375 MW
Removing dynamic limit from J_to_J3	0.14	Increasing limit J to J3 from 200 MW to 815 MW for most loss of load events. However, only 420 MW can flow on the interface because the ABC interface limitations.
I_to_J +450 MW	0.097	Minimum of +450MW on Dunwoodie South to bring LOLE just below 0.1 days/year
I_to_J unlimited	0.053	5,660 MW max flow on I to J observed in this MARS simulation
G_to_H & I_to_J unlimited	0.049	If Dunwoodie-South is unlimited, then UPNY-ConEd unlimited also has a positive impact on further decreasing the NYCA LOLE
B&C Cabes in	0.116	Allowing for additional 210 MW into J has a positive effect of decreasing the NYCA LOLE; however, LOLE still above its criterion of 0.1 days/year
Free Flow	0.042	All NYCA internal limits removed – brings the NYCA LOLE to significantly lower values

2020 RNA Short Circuit Assessment

Figure 29 below provides the results of NYISO's short circuit screening test for year 5 (2025) of the Study Period. Individual Breaker Analysis (IBA) is required for any breakers the ratings of which were exceeded by the maximum bus fault current. Either NYISO or the responsible Transmission Owner performed the analyses.

Figure 29: 2020 RNA Fault Current Analysis Summary Table for 2025 System Representation

Substation	Nominal Voltage (kV)	Lowest Breaker Rating (kA)	Owner	Maximum Bus Fault (kA)	IBA Required	Breaker(s) Overdutied
ACADEMY	345	63.0	Con Ed	35.0	N	N
ADIRONDACK	230	32.4	N. Grid	10.5	N	N
AES SOMERSET	345	40.0	NYSEG	16.7	N	N
ALPS	345	39.0	N. Grid	17.4	N	N
ALPS_EAST	345	N/A[2]	N. Grid	7.9	N	N
ALPS_PAR 1	345	N/A[2]	N. Grid	7.9	N	N
ALPS_PAR 2	345	N/A[2]	N. Grid	7.9	N	N
ASTE-ERG	138	63.0	Con Ed	49.7	N	N
ASTE-WRG	138	63.0	Con Ed	49.7	N	N
ASTORIA W-N	138	63.0	Con Ed	43.6	N	N
ASTORIA W-S	138	63.0	Con Ed	43.6	N	N
AstoriaAnnex	345	63.0	NYPA	44.8	N	N
ATHENS	345	49.0	N. Grid	35.0	N	N
BARRETT1	138	63.0	LIPA	48.8	N	N
BARRETT2	138	63.0	LIPA	48.9	N	N
BAYONNE	345	50.0	Con Ed	25.3	N	N
BOONVILLE	115	23.0	N. Grid	10.8	N	N
BOWLINE 2	345	40.0	O&R	26.8	N	N
BOWLINE1	345	40.0	O&R	27.0	N	N
BRKHAVEN	138	63.0	LIPA	26.8	N	N
BUCH138	138	40.0	Con Ed	15.5	N	N
BUCHANAN N	345	63.0	Con Ed	25.1	N	N
BUCHANAN S	345	63.0	Con Ed	37.1	N	N
C.ISLIP	138	38.9	LIPA	27.6	N	N
CANANDAIGUA	230	40.0	NYSEG	8.5	N	N
CARLE PL	138	63.0	LIPA	39.0	N	N
CHASES LAKE	230	39.0	N. Grid	9.6	N	N
CHURCHTOWN	115	21.4	NYSEG	8.3	N	N

[2] Future station with no LCB rating yet.

Substation	Nominal Voltage (kV)	Lowest Breaker Rating (kA)	Owner	Maximum Bus Fault (kA)	IBA Required	Breaker(s) Overdutied
CLARKS CNRS	345	40.0	NYSEG	11.6	N	N
CLARKS CNRS	115	40.0	NYSEG	17.4	N	N
CLAY	345	49.0	N. Grid	33.7	N	N
CLAY	115	45.0	N. Grid	38.7	N	N
COOPERS CRN	345	40.0	NYSEG	19.0	N	N
COOPERS CRN4	115	22.6	NYSEG	14.9	N	N
COOPERS CRN8	115	23.1	NYSEG	14.9	N	N
CORONA-N	138	63.0	Con Ed	49.4	N	N
CORONA-S	138	63.0	Con Ed	49.4	N	N
CRICKET VLLY	345	63.0	Con Ed	37.5	N	N
DEWITT	345	39.0	N. Grid	18.9	N	N
DEWITT	115	39.0	N. Grid	29.6	N	N
DOLSON AVE	345	63.0	NYPA	20.7	N	N
DUFFY AVE	345	58.6	LIPA	8.2	N	N
Duley	230	40.0	NYPA	7.6	N	N
DUN NO	138	40.0	Con Ed	35.5	N	N
DUN NO S6	138	63.0	Con Ed	29.5	N	N
DUN SO	138	40.0	Con Ed	30.9	N	N
DUN SO N7	138	63.0	Con Ed	26.8	N	N
DUNKIRK	230	33.0	N. Grid	10.1	N	N
DUNWOODIE	345	63.0	Con Ed	59.6	N	N
E FISHKILL	345	63.0	CH	44.6	N	N
E FISHKILL	115	40.0	CH	24.2	N	N
E13 ST	138	63.0	Con Ed	48.6	N	N
E13ST 45	345	63.0	Con Ed	53.7	N	N
E13ST 46	345	63.0	Con Ed	53.7	N	N
E13ST 47	345	63.0	Con Ed	52.2	N	N
E13ST 48	345	63.0	Con Ed	51.7	N	N
EASTOVER 230	230	49.0	N. Grid	10.8	N	N
EASTOVER N	115	49.0	N. Grid	25.3	N	N
EASTVIEW	138	63.0	Con Ed	37.0	N	N
EDIC	345	39.0	N. Grid	36.5	N	N
EGC PAR	345	63.0	NYPA	9.9	N	N
EGC-1	138	80.0	LIPA	65.3	N	N
EGC-2	138	80.0	LIPA	65.3	N	N
ELBRIDGE	345	40.0	N. Grid	16.0	N	N
ELBRIDGE D	115	49.0	N. Grid	26.6	N	N
ELWOOD 1	138	63.0	LIPA	38.3	N	N

Substation	Nominal Voltage (kV)	Lowest Breaker Rating (kA)	Owner	Maximum Bus Fault (kA)	IBA Required	Breaker(s) Overdutied
ELWOOD 2	138	63.0	LIPA	38.0	N	N
FARRAGUT	345	63.0	Con Ed	57.9	N	N
FITZPATRICK	345	37.0	NYPA	41.1	Y	N
FIVE MILE RD	345	49.0	N. Grid	7.7	N	N
FIVE MILE RD	115	49.0	N. Grid	14.4	N	N
FRASER	345	40.0	NYSEG	19.3	N	N
FRASER	115	40.0	NYSEG	19.0	N	N
FREEPORT	138	63.0	LIPA	34.2	N	N
FRESH KILLS	345	63.0	Con Ed	26.8	N	N
FRESH KILLS	138	40.0	Con Ed	32.1	N	N
GARDEN (NM)	34.5	21.0	N. Grid	17.5	N	N
GARDENVILLE	115	42.0	N. Grid	40.8	N	N
GARDENVILLE1	230	31.0	N. Grid	20.2	N	N
GILBOA 345	345	50.0	NYPA	25.3	N	N
GLNWD NO	138	63.0	LIPA	43.4	N	N
GLNWD SO	138	63.0	LIPA	43.0	N	N
GOTHLS	345	63.0	Con Ed	29.6	N	N
GOWANUS	345	63.0	Con Ed	28.7	N	N
GREENLWN	138	63.0	LIPA	28.3	N	N
HAUPAGUE	138	63.0	LIPA	21.5	N	N
High Sheldon	230	40.0	NYSEG	10.3	N	N
HILLSIDE #4	115	21.1	NYSEG	19.0	N	N
HILLSIDE #8	115	22.0	NYSEG	19.0	N	N
HILLSIDE 230	230	35.9	NYSEG	14.4	N	N
HILLSIDE#4	34.5	21.7	NYSEG	18.1	N	N
HOLBROOK	138	63.0	LIPA	47.9	N	N
HOLTSGT-GTs	138	63.0	LIPA	44.1	N	N
HUNTLEY 68	230	30.0	N. Grid	17.4	N	N
HUNTLEY 70	230	50.0	N. Grid	17.4	N	N
HURLEY	345	40.0	CH	18.7	N	N
HURLEY AVE	115	37.9	CH	16.6	N	N
INDEPENDENCE	345	44.0	N. Grid	39.0	N	N
JAMAICA	138	63.0	Con Ed	47.6	N	N
KNICKERBOCKR	345	40.0	N. Grid	27.6	N	N
LADENTOWN	345	63.0	O&R	39.1	N	N
LAFAYETTE	345	40.0	N. Grid	17.8	N	N
LCST GRV	138	63.0	LIPA	38.0	N	N
LEEDS	345	37.0	N. Grid	35.8	N	N

Substation	Nominal Voltage (kV)	Lowest Breaker Rating (kA)	Owner	Maximum Bus Fault (kA)	IBA Required	Breaker(s) Overdutied
LHH WHITE	115	38.1	N. Grid	11.8	N	N
LKE SCSS1	138	63.0	LIPA	37.5	N	N
LOVT	138	40.0	O&R	28.7	N	N
LOVT_345	345	63.0	O&R	35.7	N	N
MARCY 345	345	63.0	NYPA	35.1	N	N
MARCY 765	765	63.0	NYPA	10.2	N	N
MASSENA 765	765	63.0	NYPA	7.9	N	N
MEYER	230	40.0	NYSEG	8.4	N	N
MEYER	115	18.9	NYSEG	11.9	N	N
MEYER	34.5	21.7	NYSEG	11.4	N	N
MHTX2	138	50.0	Con Ed	13.8	N	N
Midd Tap	345	63.0	CH	19.2	N	N
MILLR PL	138	63.0	LIPA	14.6	N	N
MILLWOOD	345	63.0	Con Ed	46.1	N	N
MILLWOOD 138	138	40.0	Con Ed	19.0	N	N
MOTT HAVEN	345	63.0	Con Ed	55.2	N	N
NEWBRID	138	80.0	LIPA	64.9	N	N
NEWBRIDG	345	58.6	LIPA	8.4	N	N
NIAGARA 345	345	63.0	NYPA	33.5	N	N
NIAGRA E 115	115	42.2	NYPA	37.1	N	N
NIAGRA E 230	230	63.0	NYPA	53.8	N	N
NIAGRA W 115	115	42.2	NYPA	27.9	N	N
NIAGRA W 230	230	63.0	NYPA	53.8	N	N
NMP#1	345	50.0	N. Grid	42.7	N	N
NMP#2	345	50.0	N. Grid	43.6	N	N
NRTHPRT1	138	63.0	LIPA	59.4	N	N
NRTHPRT1-2	138	63.0	LIPA	59.4	N	N
NRTHPRT2	138	63.0	LIPA	59.4	N	N
NRTHPRT3	138	63.0	LIPA	45.2	N	N
NRTHPRT4	138	63.0	LIPA	45.2	N	N
NSCOT 77B	345	39.0	N. Grid	38.0	N	N
NSCOT 99B	345	39.0	N. Grid	37.8	N	N
NSCOT33	115	49.0	N. Grid	43.6	N	N
NSCOT77	115	48.0	N. Grid	43.5	N	N
NSCOT99	115	49.0	N. Grid	43.5	N	N
OAKDALE	115	40.0	NYSEG	27.1	N	N
OAKDALE	34.5	23.0	NYSEG	19.4	N	N
OAKDALE 345	345	40.0	NYSEG	12.7	N	N

Substation	Nominal Voltage (kV)	Lowest Breaker Rating (kA)	Owner	Maximum Bus Fault (kA)	IBA Required	Breaker(s) Overdutied
OAKWOOD	138	63.0	LIPA	27.4	N	N
ONEIDA EAST	115	23.0	N. Grid	13.3	N	N
ONEIDA WEST	115	23.0	N. Grid	13.3	N	N
OSWEGO	345	44.0	N. Grid	32.5	N	N
OSWEGO M3	115	40.0	N. Grid	21.2	N	N
PACKARD 2&3	230	49.0	N. Grid	39.5	N	N
PACKARD 4&5	230	49.0	N. Grid	39.5	N	N
PACKARD 6	230	49.0	N. Grid	39.6	N	N
PACKARD NRTH	115	62.0	N. Grid	29.5	N	N
PACKARD STH	115	58.0	N. Grid	26.3	N	N
Patnode	230	63.0	NYPA	10.5	N	N
PILGRIM	138	63.0	LIPA	57.6	N	N
PL VILLE	345	63.0	Con Ed	22.5	N	N
PL VILLW	345	63.0	Con Ed	22.8	N	N
PLATTSBURGH	115	20.3	NYPA	16.9	N	N
PLEASANT VAL	115	37.9	CH	24.5	N	N
PLTVLLEY	345	63.0	Con Ed	51.5	N	N
PORTER	230	21.0	N. Grid	17.6	N	N
PORTER	115	59.0	N. Grid	38.8	N	N
PT JEFF	138	63.0	LIPA	31.7	N	N
Q396BRNPSU	230	40.0	NYSEG	7.6	N	N
Q505_POI	230	50.0	N. Grid	8.7	N	N
Q545A_DYSING	345	50.0	TransCo	22.0	N	N
Q545A_ESTSTO	345	50.0	TransCo	8.9	N	N
Q545A_PAR	345	50.0	TransCo	9.5	N	N
Q546_230_TRA	230	40.0	N. Grid	8.8	N	N
Q556 NS66K	345	50.0	N. Grid	37.9	N	N
Q556 Rott345	345	N/A[3]	N. Grid	25.5	N	N
Q556_Prince	345	N/A[3]	N. Grid	30.5	N	N
RAINEY	345	63.0	Con Ed	57.2	N	N
RAMAPO	345	63.0	Con Ed	44.1	N	N
REYNOLDS	345	39.0	N. Grid	15.1	N	N
REYNOLDS RD	115	63.0	N. Grid	40.3	N	N
RIVERHD	138	63.0	LIPA	17.2	N	N
RNKNKOMA	138	63.0	LIPA	35.8	N	N
ROBINSON RD.	230	43.1	NYSEG	13.8	N	N

[3] Future station with no LCB rating yet.

Substation	Nominal Voltage (kV)	Lowest Breaker Rating (kA)	Owner	Maximum Bus Fault (kA)	IBA Required	Breaker(s) Overdutied
ROBINSON RD.	115	37.9	NYSEG	17.6	N	N
ROBINSON RD.	34.5	21.9	NYSEG	8.8	N	N
ROCK TAV	115	39.6	CH	25.2	N	N
ROCK TAVERN	345	63.0	CH	34.1	N	N
Roseton	345	63.0	CH	38.3	N	N
ROSLYN	138	63.0	LIPA	29.1	N	N
ROTTERDAM66H	230	39.0	N. Grid	11.1	N	N
ROTTERDAM77H	230	23.0	N. Grid	11.1	N	N
ROTTERDAM99H	230	23.0	N. Grid	11.1	N	N
RULND RD	138	63.0	LIPA	43.6	N	N
Ryan	230	40.0	NYPA	10.8	N	N
S OSWEGO	115	37.0	N. Grid	20.8	N	N
S RIPLEY	230	40.0	N. Grid	9.0	N	N
S013A	115	37.6	RGE	25.8	N	N
S080 345kV	345	40.0	RGE	19.9	N	N
S080 922	115	40.0	RGE	16.9	N	N
S082 B2	115	40.0	RGE	37.4	N	N
S082 B3	115	40.0	RGE	37.3	N	N
S122	345	40.0	RGE	18.3	N	N
S122 B1	115	50.0	RGE	33.1	N	N
S255	345	63.0	RGE	19.7	N	N
S255	115	40.0	RGE	22.0	N	N
SCHUYLER	115	23.0	N. Grid	15.0	N	N
SCRIBA	345	54.0	N. Grid	46.4	N	N
SCRIBA C	115	40.0	N. Grid	10.5	N	N
SCRIBA D	115	40.0	N. Grid	10.4	N	N
SECT 11	138	63.0	Con Ed	42.7	N	N
SECT 12	138	63.0	Con Ed	42.7	N	N
SHORE RD	345	63.0	LIPA	28.9	N	N
SHORE RD1	138	57.8	LIPA	46.8	N	N
SHORE RD2	138	57.8	LIPA	46.7	N	N
SHOREHAM1	138	63.0	LIPA	27.2	N	N
SHOREHAM2	138	63.0	LIPA	27.2	N	N
SILLS RD1	138	63.0	LIPA	31.5	N	N
SMAH	138	40.0	RECO	25.3	N	N
SPRAINBROOK	345	63.0	Con Ed	60.0	N	N
ST LAWRN 115	115	40.6	NYPA	38.8	N	N
ST LAWRN 230	230	32.4	NYPA	32.2	N	N

Substation	Nominal Voltage (kV)	Lowest Breaker Rating (kA)	Owner	Maximum Bus Fault (kA)	IBA Required	Breaker(s) Overdutied
STOLLE	115	23.9	NYSEG	19.8	N	N
STOLLE ROAD	345	40.0	NYSEG	8.8	N	N
STOLLE ROAD	230	40.0	NYSEG	13.7	N	N
STONEYRIDGE	230	40.0	NYSEG	8.0	N	N
STONY CREEK	230	40.0	NYSEG	9.3	N	N
SUGLF 345TAP	345	63.0	CH	25.6	N	N
SYOSSET	138	63.0	LIPA	33.0	N	N
Teall A	115	39.0	N. Grid	26.9	N	N
Teall B	115	39.0	N. Grid	26.9	N	N
TERMINAL	115	23.0	N. Grid	16.0	N	N
VALLEY	115	39.0	N. Grid	8.3	N	N
VERNON-E	138	63.0	Con Ed	45.5	N	N
VERNON-W	138	63.0	Con Ed	32.7	N	N
VLY STRM1	138	63.0	LIPA	54.9	N	N
VLY STRM2	138	63.0	LIPA	55.1	N	N
VOLNEY	345	45.0	N. Grid	36.5	N	N
W 49 ST	345	63.0	Con Ed	54.1	N	N
WADNGRV1	138	56.4	LIPA	25.1	N	N
WATERCURE230	230	40.0	NYSEG	14.4	N	N
WATERCURE345	345	40.0	NYSEG	9.4	N	N
WATKINS	115	39.0	N. Grid	8.4	N	N
Wethersfield	230	40.0	NYSEG	9.1	N	N
WHAV	138	40.0	O&R	29.2	N	N
WILDWOOD	138	63.0	LIPA	27.0	N	N
WILLIS 230	230	40.0	NYPA	13.5	N	N
WOOD ST.	115	40.0	NYSEG	19.7	N	N
WOODARD	115	23.0	N. Grid	15.6	N	N
YAHNUNDASIS	115	16.0	N. Grid	6.6	N	N

2020 RNA Transmission Security Violations

The NYISO identified Reliability Needs resulting from the transmission security evaluations. The transmission security Reliability Needs include both thermal loading criteria violations on the BPTF as well as dynamic stability criteria violations. For thermal loading, several 345 kV circuits in the Con Edison service territory are overloaded under N-1-1 conditions beginning in year 2025 and increasing through 2030. Additionally, the Con Edison 345 kV system has 345 kV circuit overloads under N-1-1-0 conditions beginning in 2025 and increasing through 2030. For N-1-1, Figure 30 shows the state transmission security violations for the top 10 contingency combinations. For N-1-1-0, Figure 31 only reports the controlling contingency combination of the loss of Ravenswood 3 followed by Dunwoodie — Mott Haven (72) 345 kV.

The NYISO observed dynamic stability criteria Reliability Needs for the entire study period. The criteria violations include transient voltage response violations and loss of generator synchronism. The transient voltage response violations are primarily in the Con Edison area but extend into areas adjacent to their service territory. The loss of generator synchronism is observed in generators within or near the Astoria and Greenwood load pockets, and is primarily driven by the delayed voltage recovery in the local area. Figure 32 and Figure 33 shows the BPTF buses with transient voltage response violations and the earliest year that each bus manifests the criteria violations for a given contingency.

Figure 30: Transmission Security N-1-1 Violations of the 2020 RNA Base Case

Transmission Security N-1-1 Violations of the 2020 RNA Base Case								
Zone	**Owner**	**Monitored Element**	**Normal Rating (MVA)**	**Contingency Rating (MVA)**	**1st Contingency**	**2nd Contingency**	**2025 Summer Peak Flow (%)**	**2030 Summer Peak Flow (%)**
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Sprainbrook-Dunwoodie 345 kV (W75)	Tower F38 & F39	-	112
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Loss of Ravenswood 3	Stuck breaker at W 49th St 5	-	104
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Loss of Astoria Energy 2	Stuck breaker at W 49th St 5	-	103
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Bayonne-Gowanus 345 kV (G27)	Stuck breaker at W 49th St 5	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Loss of Bayonne	Stuck breaker at W 49th St 5	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Farragut-Gowanus 345 kV (42)	Stuck breaker at Sprainbrook RS4	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Dunwoodie-Mott Haven 345 kV (71)	Stuck breaker at Sprainbrook RS4	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Dunwoodie-Mott Haven 345 kV (72)	Stuck breaker at Sprainbrook RS4	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Loss of Ravenswood 3	Stuck breaker at Sprainbrook RS4	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Loss of Astoria Energy 2	Stuck breaker at Sprainbrook RS4	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Sprainbrook-Dunwoodie 345 kV (W75)	Tower F38 & F39	-	112
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Farragut-Gowanus 345 kV (42)	Stuck breaker at Sprainbrook RS5	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Dunwoodie-Mott Haven 345 kV (71)	Stuck breaker at Sprainbrook RS5	-	102
J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Dunwoodie-Mott Haven 345 kV (72)	Stuck breaker at Sprainbrook RS5	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Loss of Ravenswood 3	Stuck breaker at Sprainbrook RS5	-	102

Transmission Security N-1-1 Violations of the 2020 RNA Base Case								
Zone	**Owner**	**Monitored Element**	**Normal Rating (MVA)**	**Contingency Rating (MVA)**	**1st Contingency**	**2nd Contingency**	**2025 Summer Peak Flow (%)**	**2030 Summer Peak Flow (%)**
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Loss of Astoria Energy 2	Stuck breaker at Sprainbrook RS5	-	102
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Bayonne-Gowanus 345 kV (G27)	Stuck breaker at Sprainbrook RS5	-	101
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Loss of Bayonne	Stuck breaker at Sprainbrook RS5	-	101
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	-	-	-	-
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	-	-	-	-
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Loss of Ravenswood 3	Dunwoodie-Mott Haven 345 kV (72)	110	118
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Loss of Ravenswood 3	Stuck breaker at Mott Haven 7	110	118
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Loss of Ravenswood 3	Stuck breaker at Mott Haven 3	110	118
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Loss of Ravenswood 3	Stuck breaker at Dunwoodie 8	107	115
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Dunwoodie-Mott Haven 345 kV (72)	Loss of Ravenswood 3	109	114
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Dunwoodie-Shore Road 345 kV (Y50)	Stuck breaker at Dunwoodie 7	-	104
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Freshkills 345/138 kV (TB1)	Dunwoodie-Mott Haven 345 kV (72)	-	102
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Freshkills 345/138 kV (TB1)	Stuck breaker at Mott Haven 3	-	102
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Freshkills 345/138 kV (TB1)	Stuck breaker at Mott Haven 7	-	102
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Bayonne-Gowanus 345 kV (G27)	Dunwoodie-Mott Haven 345 kV (72)	-	102

Transmission Security N-1-1 Violations of the 2020 RNA Base Case								
Zone	**Owner**	**Monitored Element**	**Normal Rating (MVA)**	**Contingency Rating (MVA)**	**1st Contingency**	**2nd Contingency**	**2025 Summer Peak Flow (%)**	**2030 Summer Peak Flow (%)**
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Loss of Bayonne	Dunwoodie-Mott Haven 345 kV (72)	-	102
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Sprainbrook-W 49th St 345 kV (51)	Stuck breaker at Sprainbrook RS4	101	101
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Sprainbrook-W 49th St 345 kV (52)	Stuck breaker at Sprainbrook RS5	101	101
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Loss of Ravenswood 3	Dunwoodie-Mott Haven 345 kV (71)	108	116
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Loss of Ravenswood 3	Stuck breaker at Mott Haven BTE	108	116
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Loss of Ravenswood 3	Stuck breaker at Mott Haven 2	108	116
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Dunwoodie-Mott Haven 345 kV (71)	Loss of Ravenswood 3	108	114
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Loss of Ravenswood 3	Stuck breaker at Dunwoodie 3	105	113
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Dunwoodie-Shore Road 345 kV (Y50)	Stuck breaker at Dunwoodie 5	-	103
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Dunwoodie-Mott Haven 345 kV (71)	Stuck breaker at Sprainbrook RS4	-	102
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Dunwoodie-Mott Haven 345 kV (71)	Stuck breaker at Sprainbrook RS5	-	102
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Freshkills 345/138 kV (TB1)	Dunwoodie-Mott Haven 345 kV (71)	-	101
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Freshkills 345/138 kV (TB1)	Stuck breaker at Mott Haven BTE	-	101
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (72)	785	925	Freshkills 345/138 kV (TB1)	Stuck breaker at Mott Haven 2	-	101
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	Mott Haven-Rainey 345 kV (Q11)	Loss of Ravenswood 3	-	108

Transmission Security N-1-1 Violations of the 2020 RNA Base Case								
Zone	**Owner**	**Monitored Element**	**Normal Rating (MVA)**	**Contingency Rating (MVA)**	**1st Contingency**	**2nd Contingency**	**2025 Summer Peak Flow (%)**	**2030 Summer Peak Flow (%)**
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey West 345 kV (Q12)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	Mott Haven-Rainey 345 kV (Q12)	Loss of Ravenswood 3	-	108
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	Loss of Ravenswood 3	Stuck breaker at Rainey 4W	-	101
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	Loss of Ravenswood 3	Stuck breaker at Rainey 7W	-	101
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	-	-	-	-

Transmission Security N-1-1 Violations of the 2020 RNA Base Case								
Zone	**Owner**	**Monitored Element**	**Normal Rating (MVA)**	**Contingency Rating (MVA)**	**1st Contingency**	**2nd Contingency**	**2025 Summer Peak Flow (%)**	**2030 Summer Peak Flow (%)**
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	-	-	-	-
J	ConEd	Mott Haven-Rainey East 345 kV (Q11)	785	925	-	-	-	-
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Loss of Ravenswood 3	Stuck Breaker at Goethals 5	102	130
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Loss of Ravenswood 3	Gowanus - Goethals 345 kV (25)	-	128
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Loss of Ravenswood 3	Stuck Breaker at Goethals 3	-	128
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Loss of Ravenswood 3	Stuck Breaker at Goethals 9	-	127
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Loss of Ravenswood 3	Stuck Breaker at Gowanus 6	-	114
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Sprainbrook-W 49th St 345 kV (51)	Stuck Breaker at Goethals 5	-	110
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Sprainbrook-W 49th St 345 kV (52)	Stuck Breaker at Goethals 5	-	110
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Sprainbrook-W 49th St 345 kV (51)	Stuck Breaker at Goethals 3	-	108
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Sprainbrook-W 49th St 345 kV (52)	Stuck Breaker at Goethals 3	-	108
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Sprainbrook-W 49th St 345 kV (51)	Gowanus - Goethals 345 kV (25)	-	108
J	ConEd	Goethals-Gowanus 345 kV (26)	518	738	Sprainbrook-W 49th St 345 kV (52)	Gowanus - Goethals 345 kV (25)	-	108

Transmission Security N-1-1 Violations of the 2020 RNA Base Case								
Zone	**Owner**	**Monitored Element**	**Normal Rating (MVA)**	**Contingency Rating (MVA)**	**1st Contingency**	**2nd Contingency**	**2025 Summer Peak Flow (%)**	**2030 Summer Peak Flow (%)**
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Loss of Ravenswood 3	Gowanus - Goethals 345 kV (26)	103	130
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Loss of Ravenswood 3	Stuck Breaker at Goethals 8	102	130
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Sprainbrook-W 49th St 345 kV (51)	Gowanus - Goethals 345 kV (26)	101	111
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Sprainbrook-W 49th St 345 kV (52)	Gowanus - Goethals 345 kV (26)	101	111
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Sprainbrook-W 49th St 345 kV (51)	Stuck Breaker at Goethals 8	-	110
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Sprainbrook-W 49th St 345 kV (52)	Stuck Breaker at Goethals 8	-	110
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Dunwoodie-Mott Haven 345 kV (72)	Gowanus - Goethals 345 kV (26)	-	107
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Dunwoodie-Mott Haven 345 kV (72)	Stuck Breaker at Goethals 8	-	107
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Dunwoodie-Mott Haven 345 kV (71)	Gowanus - Goethals 345 kV (26)	-	106
J	ConEd	Goethals-Gowanus 345kV (25)	518	738	Dunwoodie-Mott Haven 345 kV (71)	Stuck Breaker at Goethals 8	-	105
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Loss of Ravenswood 3	Tower W89 & W90	106	109
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Dunwoodie-Mott Haven 345 kV (71)	Tower W89 & W90	-	105
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Dunwoodie-Mott Haven 345 kV (72)	Tower W89 & W90	-	105
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Freshkills 345/138 kV (TB1)	Tower W89 & W90	-	105
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Gowanus 345/138 kV (14TR)	Tower W89 & W90	-	104

Transmission Security N-1-1 Violations of the 2020 RNA Base Case								
Zone	**Owner**	**Monitored Element**	**Normal Rating (MVA)**	**Contingency Rating (MVA)**	**1st Contingency**	**2nd Contingency**	**2025 Summer Peak Flow (%)**	**2030 Summer Peak Flow (%)**
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Sprainbrook-W 49th St 345 kV (51)	Tower W89 & W90	-	104
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Sprainbrook-W 49th St 345 kV (52)	Tower W89 & W90	-	104
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Bayonne-Gowanus 345 kV (G27)	Tower W89 & W90	-	104
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Loss of Bayonne	Tower W89 & W90	-	104
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (N7)	366	423	Freshkills 345/138 kV (TA1)	Tower W89 & W90	-	104
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Loss of Ravenswood 3	Tower W89 & W90	103	107
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Farragut-Gowanus 345 kV (42)	Tower W89 & W90	-	106
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Sprainbrook-W 49th St 345 kV (51)	Tower W89 & W90	-	105
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Sprainbrook-W 49th St 345 kV (52)	Tower W89 & W90	-	105
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Bayonne-Gowanus 345 kV (G27)	Tower W89 & W90	-	105
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Loss of Bayonne	Tower W89 & W90	-	105
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Gowanus 345/138 kV (14TR)	Tower W89 & W90	-	104
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Freshkills 345/138 kV (TA1)	Tower W89 & W90	-	103
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Dunwoodie-Shore Road 345 kV (Y50)	Tower W89 & W90	-	102
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Dunwoodie-Mott Haven 345 kV (71)	Tower W89 & W90	-	102

Transmission Security N-1-1 Violations of the 2020 RNA Base Case								
Zone	**Owner**	**Monitored Element**	**Normal Rating (MVA)**	**Contingency Rating (MVA)**	**1st Contingency**	**2nd Contingency**	**2025 Summer Peak Flow (%)**	**2030 Summer Peak Flow (%)**
I	ConEd	Sprainbrook/Dunwoodie 345/138 kV (S6)	309	438	Dunwoodie-Mott Haven 345 kV (72)	Tower W89 & W90	-	102
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	Loss of Ravenswood 3	Sprainbrook/Dunwoodie 345/138 kV (N7)	-	106
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	Loss of Ravenswood 3	Stuck breaker at Sprainbrook RN3	-	106
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	Loss of Ravenswood 3	Stuck breaker at Sprainbrook RN4	-	106
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	Loss of Ravenswood 3	Stuck breaker at Sprainbrook RN5	-	106
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	Loss of Ravenswood 3	Stuck breaker at Sprainbrook RN6	-	106
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	-	-	-	-
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	-	-	-	-
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	-	-	-	-
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	-	-	-	-
I	ConEd	Dunwoodie 345/138 kV (W73)	310	388	-	-	-	-

Figure 31: Transmission Security N-1-1-0 Violations of the 2020 RNA Base Case

Transmission Security N-1-1-0 Violations of the 2020 RNA Base Case								
Zone	**Owner**	**Monitored Element**	**Normal Rating (MVA)**	**Contingency Rating (MVA)**	**1st Contingency**	**2nd Contingency**	**2025 Summer Peak Flow (%)**	**2030 Summer Peak Flow (%)**
I/J	ConEd	Dunwoodie-Mott Haven 345 kV (71)	785	925	Loss of Ravenswood 3	Dunwoodie-Mott Haven 345 kV (72)	132	149
I/J	ConEd	Sprainbrook-W49th St 345 kV (51)	844	1029	Loss of Ravenswood 3	Dunwoodie-Mott Haven 345 kV (72)	-	106
I/J	ConEd	Sprainbrook-W49th St 345 kV (52)	844	1029	Loss of Ravenswood 3	Dunwoodie-Mott Haven 345 kV (72)	-	106

Figure 32: BPTF Bus List for Transient Voltage Response N-1 Violation

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
126249	26T	345	10	NYC	CONED	2030	(2), (3)
126262	BUCHANAN N	345	8	MILLWOOD	CONED	2025	(2), (3)
126263	BUCHANAN S	345	8	MILLWOOD	CONED	2025	(1), (2), (3)
126265	COGNTECH	345	10	NYC	CONED	2030	(2), (3)
126266	DUNWOODIE	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126267	E VIEW 2N	345	9	DUNWOODIE	CONED	2025	(2), (3)
126268	E VIEW 1N	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126269	E VIEW 2S	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126270	E VIEW 1S	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126272	E13ST 45	345	10	NYC	CONED	2024	(1), (2), (3)
126273	E13ST 46	345	10	NYC	CONED	2024	(1), (2), (3)
126274	E13ST 47	345	10	NYC	CONED	2024	(1), (2), (3)
126275	E13ST 48	345	10	NYC	CONED	2024	(1), (2), (3)
126277	FARRAGUT	345	10	NYC	CONED	2024	(1), (2), (3)
126280	FARRAGUT TX9	345	10	NYC	CONED	2024	(1), (2), (3)
126282	FRESH KILLS	345	10	NYC	CONED	2030	(2), (3)
126283	GOTHLS	345	10	NYC	CONED	2030	(2), (3)
126284	GOTHLS R	345	10	NYC	CONED	2030	(2)
126285	GOW R4	345	10	NYC	CONED	2030	(2), (3)
126286	GOW R16	345	10	NYC	CONED	2030	(2), (3)
126287	GOWANUS	345	10	NYC	CONED	2030	(2), (3)
126291	MILLWOOD	345	8	MILLWOOD	CONED	2025	(1), (2), (3)
126292	PL VILLE	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126293	PL VILLW	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126295	RAINEY	345	10	NYC	CONED	2024	(1), (2), (3)
126298	SPRAINBROOK	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
126299	REACBUS	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126301	TREMONT	345	10	NYC	CONED	2025	(2), (3)
126304	W 49 ST	345	10	NYC	CONED	2024	(1), (2), (3)
126305	WOOD A	345	8	MILLWOOD	NYSEG	2030	(2), (3)
126306	WOOD B	345	8	MILLWOOD	NYSEG	2025	(1), (2), (3)
126319	WOOD C	345	8	MILLWOOD	NYSEG	2025	(1), (2), (3)
126342	W74 TAP	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126343	W73 TAP	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126517	REACM51	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126518	REACM52	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126590	GOWANUS 41SR	345	10	NYC	CONED	2024	(1), (2), (3)
126591	GOWANUS 42SR	345	10	NYC	CONED	2024	(1), (2), (3)
126600	REAC71	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126601	REAC72	345	9	DUNWOODIE	CONED	2025	(1), (2), (3)
126641	MOTT HAVEN	345	10	NYC	CONED	2024	(1), (2), (3)
126642	RAINEY WEST	345	10	NYC	CONED	2024	(1), (2), (3)
126643	RAINEY EAST	345	10	NYC	CONED	2024	(1), (2), (3)
126644	FARRAGUT WES	345	10	NYC	CONED	2024	(1), (2), (3)
126645	FARRAGUT EAS	345	10	NYC	CONED	2024	(1), (2), (3)
126847	ACADEMY	345	10	NYC	CONED	2025	(1), (2), (3)
126865	RAV3 60M	345	10	NYC	CONED	2024	(1), (2), (3)
126866	RAV3 60L	345	10	NYC	CONED	2024	(1), (2)
127100	B44	345	10	NYC	CONED	2024	(1), (2), (3)
128248	ANNTRHIGH	345	10	NYC	CONED	2024	(1), (2), (3)
128252	BAYONNE	345	10	NYC	CONED	2030	(2), (3)
128315	Q516GSU_HV	345	10	NYC	CONED	2030	(2), (3)
128699	MILLW345_C1	345	8	MILLWOOD	CONED	2025	(1), (2), (3)

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
128700	MILLW345_C2	345	8	MILLWOOD	CONED	2025	(1), (2), (3)
128701	ASTOR REAC	345	10	NYC	NYPA	2024	(1), (2), (3)
128702	BAYO_XFMR_HV	345	10	NYC	CONED	2030	(2), (3)
128822	E.G.C.-1	345	11	L ISLAND	LIPA	2025	(1), (2), (3)
128823	E.G.C.-2	345	11	L ISLAND	LIPA	2025	(1), (2), (3)
128824	EGC DUM	345	11	L ISLAND	LIPA	2025	(1), (2), (3)
128825	EGC PAR	345	11	L ISLAND	LIPA	2025	(1), (2), (3)
128830	HMP HRBR	345	11	L ISLAND	LIPA	2025	(1), (2), (3)
128835	SHORE RD	345	11	L ISLAND	LIPA	2024	(1), (2), (3)
128842	NEPTCONV	345	11	L ISLAND	LIPA	2025	(2), (3)
128847	NWBRG	345	11	L ISLAND	LIPA	2025	(2), (3)
129202	BARRETT1	138	11	L ISLAND	LIPA	2030	(2), (3)
129203	BARRETT2	138	11	L ISLAND	LIPA	2030	(2), (3)
129204	BRRT PH	138	11	L ISLAND	LIPA	2030	(2), (3)
129205	BRTGT1-8	138	11	L ISLAND	LIPA	2030	(2), (3)
129206	BRTGT9-12	138	11	L ISLAND	LIPA	2030	(2), (3)
129233	VLY STRM	138	11	L ISLAND	LIPA	2025	(2), (3)
129234	VLY STRM2	138	11	L ISLAND	LIPA	2025	(2), (3)
129235	V STRM P	138	11	L ISLAND	LIPA	2024	(1), (2), (3)
129247	L SUCS	138	11	L ISLAND	LIPA	2025	(1), (2), (3)
129248	L SUCS2	138	11	L ISLAND	LIPA	2025	(1), (2), (3)
129249	L SUCSPH	138	11	L ISLAND	LIPA	2024	(1), (2), (3)
129265	CARLE PL	138	11	L ISLAND	LIPA	2025	(2), (3)
129270	E.G.C.	138	11	L ISLAND	LIPA	2030	(2), (3)
129271	E.G.C.-2	138	11	L ISLAND	LIPA	2030	(2), (3)
129276	FREEPORT	138	11	L ISLAND	LIPA	2030	(2), (3)
129281	GLNWD GT	138	11	L ISLAND	LIPA	2025	(1), (2), (3)

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
129282	GLNWD NO	138	11	L ISLAND	LIPA	2025	(1), (2), (3)
129283	GLNWD SO	138	11	L ISLAND	LIPA	2025	(1), (2), (3)
129288	ROSLYN	138	11	L ISLAND	LIPA	2025	(1), (2), (3)
129293	SHORE RD	138	11	L ISLAND	LIPA	2025	(1), (2), (3)
129294	SHORE RD2	138	11	L ISLAND	LIPA	2025	(1), (2), (3)
129305	LCST GRV	138	11	L ISLAND	LIPA	2030	(2)
129310	NEWBRGE	138	11	L ISLAND	LIPA	2030	(2), (3)
130758	WOODA345	345	8	MILLWOOD	NYSEG	2030	(2), (3)
130759	WOODB345	345	8	MILLWOOD	NYSEG	2025	(1), (2), (3)
130877	WOODC345	345	8	MILLWOOD	NYSEG	2025	(1), (2), (3)
135222	WOOD D	345	8	MILLWOOD	NYSEG	2030	(2), (3)
146874	LOVETT345 ST	345	7	HUDSON	O&R	2030	(2), (3)
147829	ASTOR345	345	10	NYC	NYPA	2024	(1), (2), (3)
147857	DVNPT NK	345	9	DUNWOODIE	NYPA	2025	(1), (2), (3)
148707	AST_E_2	345	10	NYC	NYPA	2025	(1), (2), (3)

Notes:

Event (1) UC11

Event (2) UC25A

Event (3) UC25B

Figure 33: BPTF Bus List for Transient Voltage Response N-1-1 Violation

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
126249	26T	345	10	NYC	CONED	2025	(4), (5), (6), (9), (10), (11), (12), (13), (14), (15), (19)
126262	BUCHANAN N	345	8	MILLWOOD	CONED	2025	(5), (8), (9), (10), (11), (12), (13), (14), (15), (19)
126263	BUCHANAN S	345	8	MILLWOOD	CONED	2025	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
126265	COGNTECH	345	10	NYC	CONED	2025	(4), (5), (6), (9), (10), (11), (12), (13), (14), (15), (19)
126266	DUNWOODIE	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126267	E VIEW 2N	345	9	DUNWOODIE	CONED	2025	(2), (5), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126268	E VIEW 1N	345	9	DUNWOODIE	CONED	2024	(2), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126269	E VIEW 2S	345	9	DUNWOODIE	CONED	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126270	E VIEW 1S	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126272	E13ST 45	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (14), (15), (16), (18), (19)
126273	E13ST 46	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (15), (16), (18), (19)
126274	E13ST 47	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126275	E13ST 48	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (16), (18), (19)
126277	FARRAGUT	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (13), (14), (15), (16)

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
126280	FARRAGUT TX9	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126282	FRESH KILLS	345	10	NYC	CONED	2025	(4), (5), (6), (9), (10), (11), (12), (13), (14), (15), (19)
126283	GOTHLS	345	10	NYC	CONED	2025	(4), (5), (6), (9), (10), (11), (12), (13), (14), (15), (19)
126284	GOTHLS R	345	10	NYC	CONED	2030	(15), (19)
126285	GOW R4	345	10	NYC	CONED	2025	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
126286	GOW R16	345	10	NYC	CONED	2025	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
126287	GOWANUS	345	10	NYC	CONED	2025	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
126290	LADENTWN	345	7	HUDSON	CONED	2030	(19)
126291	MILLWOOD	345	8	MILLWOOD	CONED	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
126292	PL VILLE	345	9	DUNWOODIE	CONED	2024	(2), (4), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
126293	PL VILLW	345	9	DUNWOODIE	CONED	2024	(2), (4), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
126295	RAINEY	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126298	SPRAINBROOK	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126299	REACBUS	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
126301	TREMONT	345	10	NYC	CONED	2025	(1), (2), (4), (5), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
126304	W 49 ST	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126305	WOOD A	345	8	MILLWOOD	NYSEG	2025	(4), (6), (8), (9), (10), (11), (12), (13), (14), (15), (19)
126306	WOOD B	345	8	MILLWOOD	NYSEG	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
126319	WOOD C	345	8	MILLWOOD	NYSEG	2025	(4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (19)
126342	W74 TAP	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126343	W73 TAP	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126517	REACM51	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126518	REACM52	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126590	GOWANUS 41SR	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126591	GOWANUS 42SR	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126600	REAC71	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126601	REAC72	345	9	DUNWOODIE	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
126641	MOTT HAVEN	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126642	RAINEY WEST	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126643	RAINEY EAST	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126644	FARRAGUT WES	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126645	FARRAGUT EAS	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126847	ACADEMY	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126865	RAV3 60M	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
126866	RAV3 60L	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
127100	B44	345	10	NYC	CONED	2024	(1), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16)
128248	ANNTRHIGH	345	10	NYC	CONED	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
128252	BAYONNE	345	10	NYC	CONED	2025	(4), (5), (6), (9), (10), (11), (12), (13), (14), (15), (19)

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
128315	Q516GSU_HV	345	10	NYC	CONED	2025	(4), (5), (6), (9), (10), (11), (12), (13), (14), (15), (19)
128699	MILLW345_C1	345	8	MILLWOOD	CONED	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
128700	MILLW345_C2	345	8	MILLWOOD	CONED	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
128701	ASTOR REAC	345	10	NYC	NYPA	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
128702	BAYO_XFMR_HV	345	10	NYC	CONED	2025	(4), (5), (6), (9), (10), (11), (12), (13), (14), (15), (19)
128822	E.G.C.-1	345	11	L ISLAND	LIPA	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), (18), (19)
128823	E.G.C.-2	345	11	L ISLAND	LIPA	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), (18), (19)
128824	EGC DUM	345	11	L ISLAND	LIPA	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), (18), (19)
128825	EGC PAR	345	11	L ISLAND	LIPA	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), (18), (19)
128830	HMP HRBR	345	11	L ISLAND	LIPA	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), (18), (19)
128835	SHORE RD	345	11	L ISLAND	LIPA	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (17), (18), (19)
128842	NEPTCONV	345	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (10), (11), (12), (13), (15), (19)

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
128847	NWBRG	345	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (10), (11), (12), (13), (15), (19)
129202	BARRETT1	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (11), (15), (19)
129203	BARRETT2	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (11), (15), (19)
129204	BRRT PH	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (9), (19)
129205	BRTGT1-8	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (11), (15), (19)
129206	BRTGT9-12	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (11), (15), (19)
129233	VLY STRM	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (19)
129234	VLY STRM2	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (19)
129235	V STRM P	138	11	L ISLAND	LIPA	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
129247	L SUCS	138	11	L ISLAND	LIPA	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
129248	L SUCS2	138	11	L ISLAND	LIPA	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
129249	L SUCSPH	138	11	L ISLAND	LIPA	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
129265	CARLE PL	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (10), (11), (12), (15), (19)
129270	E.G.C.	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (9), (15), (19)
129271	E.G.C.-2	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (9), (15), (19)
129276	FREEPORT	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (9), (19)
129281	GLNWD GT	138	11	L ISLAND	LIPA	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
129282	GLNWD NO	138	11	L ISLAND	LIPA	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
129283	GLNWD SO	138	11	L ISLAND	LIPA	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
129288	ROSLYN	138	11	L ISLAND	LIPA	2025	(4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (19)

Bus Number	Bus Name	Base kV	Area Num	Area Name	Owner Name	Earliest Year of observed transient voltage response violations	Contingency Events which result in transient voltage response violations for this bus (See Note Below)
129293	SHORE RD	138	11	L ISLAND	LIPA	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
129294	SHORE RD2	138	11	L ISLAND	LIPA	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
129310	NEWBRGE	138	11	L ISLAND	LIPA	2025	(5), (6), (9), (19)
130758	WOODA345	345	8	MILLWOOD	NYSEG	2025	(3), (4), (6), (8), (9), (10), (11), (12), (13), (14), (15), (19)
130759	WOODB345	345	8	MILLWOOD	NYSEG	2024	(2), (4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
130877	WOODC345	345	8	MILLWOOD	NYSEG	2025	(4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (19)
135222	WOOD D	345	8	MILLWOOD	NYSEG	2025	(4), (6), (8), (9), (10), (11), (12), (13), (14), (15), (19)
146874	LOVETT345 ST	345	7	HUDSON	O&R	2025	(4), (5), (6), (8), (9), (10), (11), (12), (13), (14), (15), (19)
147829	ASTOR345	345	10	NYC	NYPA	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)
147857	DVNPT NK	345	9	DUNWOODIE	NYPA	2024	(2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (19)
148707	AST_E_2	345	10	NYC	NYPA	2024	(1), (2), (4), (5), (6), (7), (8), (9), (10), (11), (12), (13), (14), (15), (16), (18), (19)

Notes:

Event (1) ConEd16

Event (2) ConEd23_Q510

Event (3) TE02-UC02

Event (4) TE03-UC03

Event (5) TE20-UC20

Event (6) UC11

Event (7) UC19

Event (8) UC25A

Event (9) UC25B

Event (10) UC32_Q510

Event (11) UC33_Q510

Event (12) UC34_Q510

Event (13) UC35_Q510

Event (14) UC36_Q510

Event (15) UC38_Q510

Event (16) UC39_Q510

Event (17) UC048A_Q510

Event (18) UC57_Q510

Event (19) UC5_Q510

Appendix E – Additional Exploratory Scenario Analysis

Additional to the scenarios described in the body of the RNA report, the NYISO performed two exploratory scenarios:

1. Further Simplified External Areas Model - Resource Adequacy only
   - Starting with the simplified external model described in footnote 8 and also in the assumptions matrix in Appendix D, the NYISO removed all load and generation from external areas along with removing interfaces between external areas, followed by inserting fixed amounts of capacity in each external area.
2. Different Load Shape - Resource Adequacy only
   - The Resource Adequacy Base Cases use historical load shapes from 2002, 2006, and 2007. The Climate Change Phase 1 study developed forward-looking hourly load shapes. This exploratory scenario identified that additional collaboration with the Load Forecast Task Force and other stakeholders will be initiated, to identify if and how future-looking load shapes would better represent an ever-changing system.

Further Simplified External Areas Model

During the 2020 RNA, the External Areas Model for the RNA Base Case was simplified to consolidate five PJM (mid-Atlantic) areas into a single area and eight ISO-NE areas into a single area.

This further simplified scenario evaluates an alternative model for the external, non-NYCA, regions in the MARS model. Starting in this RNA, the NYISO simplified the representation of each external region so that they are represented by a single area, as shown in Figure 46**Error! Reference source not found.** in the main report. This scenario expands on this work by evaluating if additional simplifications to the external region model can be made while maintaining consistent results.

To achieve this objective, the NYISO performed the following actions in each external region to simplify the representation and to model a system in which the NYCA receives no emergency assistance:

- Removing all load and generation from each external region;
- Remove pool-to-pool ties between external regions; and
- Disable the ability of UDRs to return from the host external region, while still allowing emergency assistance over the interface if the resource is otherwise unavailable.

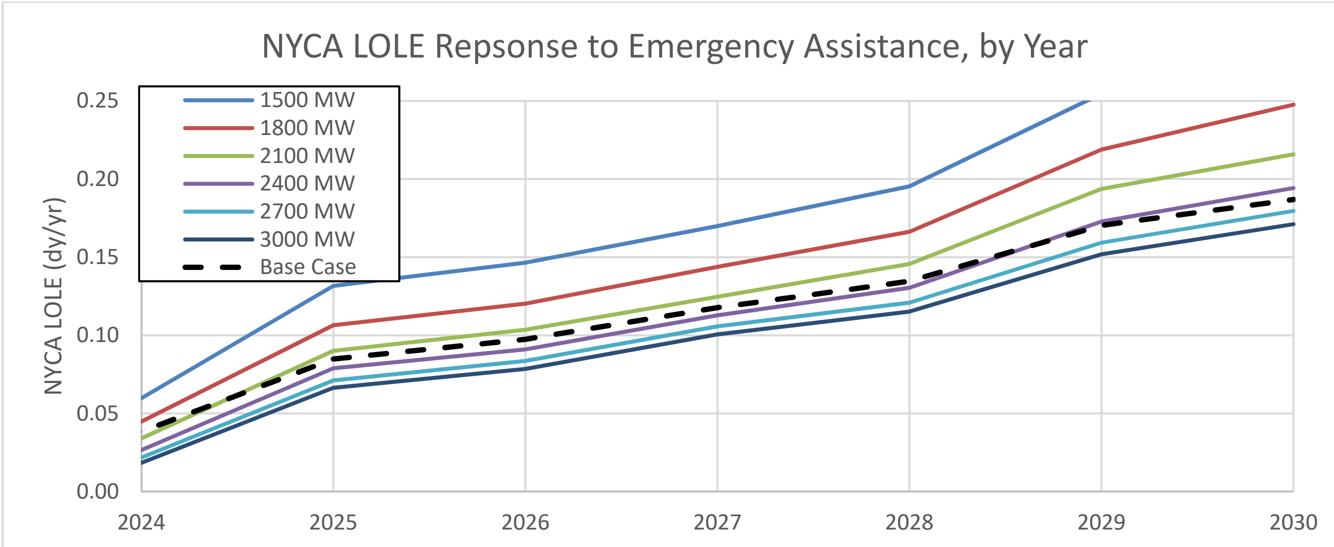
With the baseline set, the NYISO evaluated the impact of adding fixed, always-available capacity resources to each of the external regions. This analysis revealed the NYCA LOLE was not particularly sensitive to capacity additions in any one region (*e.g.,* adding 600 MW in New England yielded a similar result to adding 600 MW in Ontario), subject to transfer limit constraints (*e.g.,* New England could not provide more than 1,400 MW total).

The next phase of this analysis evaluated the impact of modeling discrete capacity combinations in each external region, as shown in Figure 34. For low levels of total assistance, the results aligned with the single area adjustments previously discussed (*i.e.,* the 1,200 MW cumulative result was similar to adding 1,200 MW to PJM or New England). Figure 34 also includes the observed NYCA LOLE for 2030, when compared to the Base Case results (0.186), between 2,400 and 2,700 MW of always-available assistance replace the external model. The amount of assistance needed through time increased. See Figure 35, showing the 2024 Base Case result (0.016) using between 1,800 and 2,100 MW of assistance.

Figure 34: Amount of Assistance Needed in the Simulation through Time

Case ID	HQ	IESO	ISONE	PJM	Total	2030 NYCA LOLE (dy/yr)
Case 0	0	0	0	0	0	0.812
Case 1	300	0	0	0	300	0.652
Case 2	300	300	300	300	1,200	0.354
Case 3	300	400	400	400	1,500	0.292
Case 4	300	500	500	500	1,800	0.248
Case 5	300	600	600	600	2,100	0.216
Case 6	300	700	700	700	2,400	0.194
Case 7	300	800	800	800	2,700	0.18
Case 8	300	900	900	900	3,000	0.171
Case 9	300	1,000	1,000	1,000	3,300	0.166

Figure 35: NYCA LOLE Response to Emergency Assistance



The next, and final, phase of this exploratory analysis was to apply derates to the amount of available emergency assistance based upon the Area K load, as a proxy for NYCA Load. The derates were applied by utilizing MARS functionality for ambient temperature derates to thermal units. This approach allows for the simplified model to mimic the original model by having potentially less assistance available in the higher load levels. Two derate profiles were tested, shown in Figure 36, on the 2,400, 2,700, and 3,000 MW assistance cases Figure 37 to Figure 39, respectively.

Figure 36: Emergency Assistance Profiles Tested

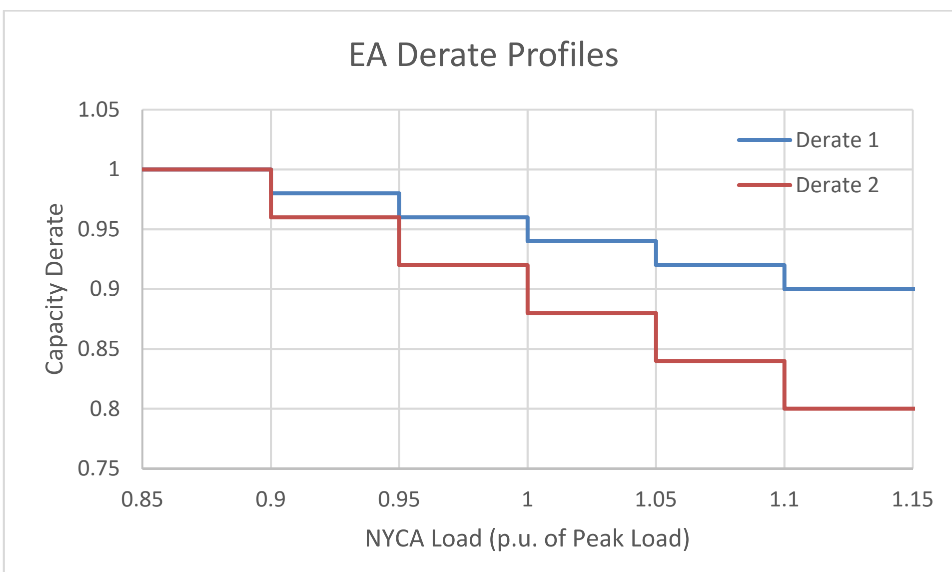


Figure 37: Base Emergency Assistance Level: 2400 MW

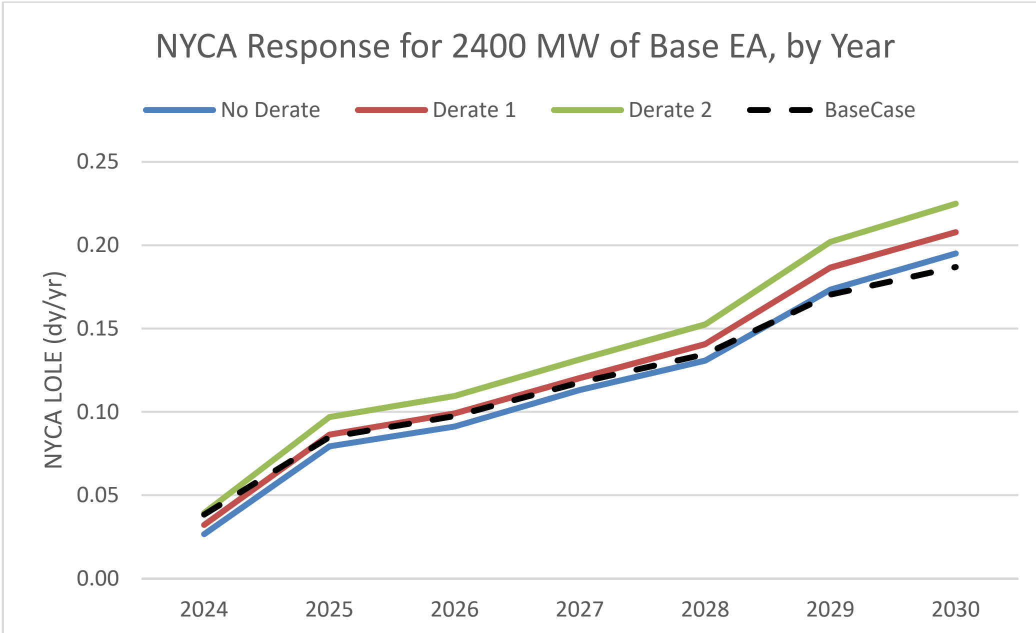


Figure 38: Base Emergency Assistance Level: 2700 MW

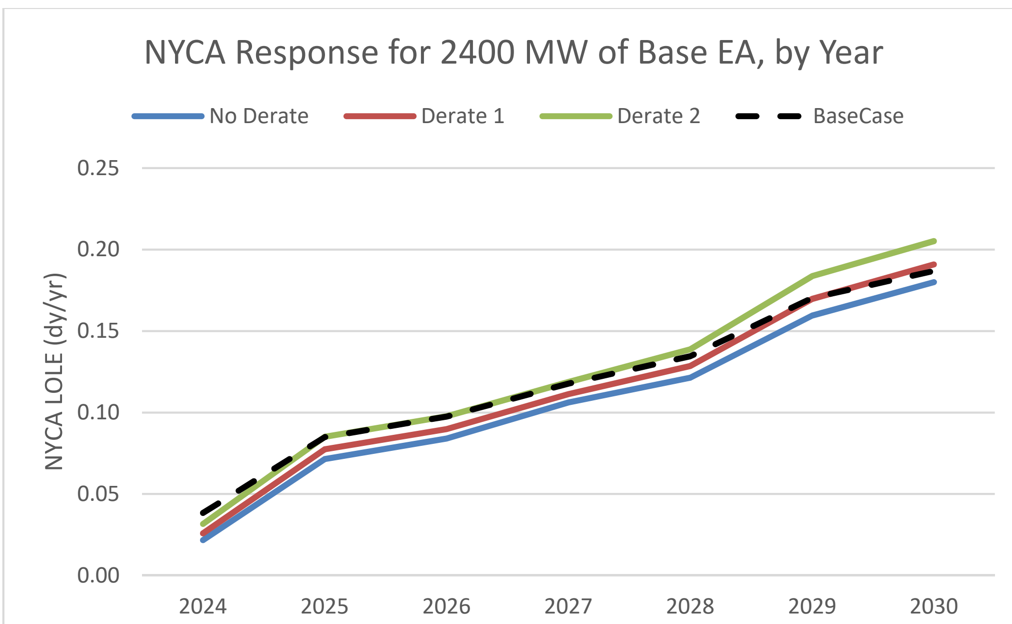
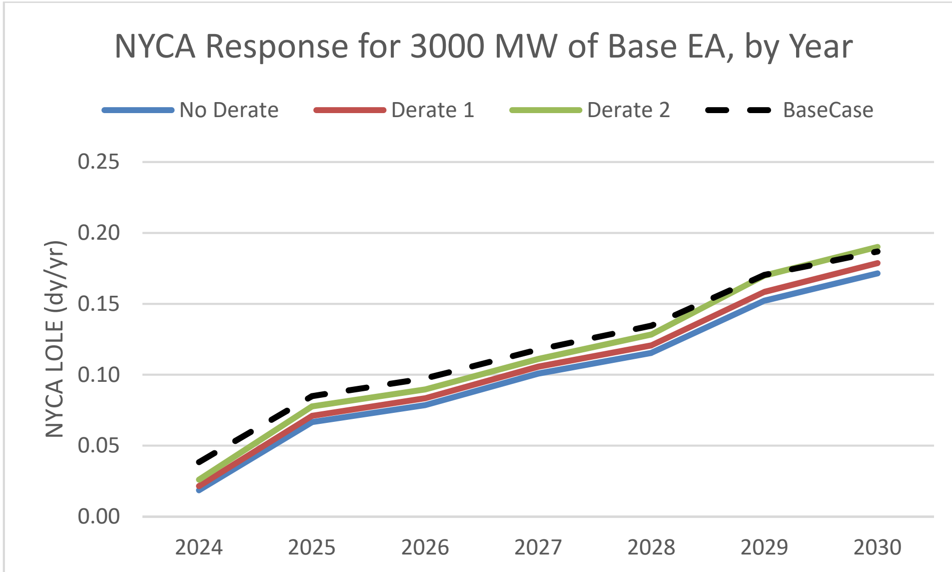


Figure 39: Base Emergency Assistance Level: 3000 MW



The NYISO intends to continue refining this analysis with discussion at the Electric System Planning Working Group and other stakeholder forums, as applicable in order to determine potential changes.

Different Load Shape - Resource Adequacy only

The Resource Adequacy Base Cases use historical shapes from 2002, 2006, and 2007, a practice established in the 2014 RNA. These shapes were selected to represent differing weather conditions, 2006 for extreme hot weather, 2002 for consistent but not extreme weather, and 2007 for typical weather. These shapes are aligned with the load forecast uncertainly levels, 2006 associated with the highest, 2002 with the second highest, and 2007 associated with the remaining uncertainty levels. Prior to the 2014 RNA, resource adequacy analysis was performed using only the 2002 reference shape.

In 2019, the NYISO engaged in the Climate Change Phase 1 Study to develop a set of future-looking hourly load shapes considering various energy efficiency and climate goals. The outputs from the Phase 1 study feeds into the Phase 2 study, which is analyzing reliability impact issues with a potential 2040 power system. The NYISO will continue to explore building on the work from the Climate Change studies for application in future resource adequacy analysis, and intends to collaborate with the Load Forecasting Task Force and other stakeholders' forums, as applicable in order to determine potential changes to be studied.

Appendix F - Historic Congestion

Appendix A of Attachment Y of the OATT states:

As part of its CSPP, the ISO will prepare summaries and detailed analysis of historic and projected congestion across the NYS Transmission System. This will include analysis to identify the significant causes of historic congestion in an effort to help Market Participants and other interested parties distinguish persistent and addressable congestion from congestion that results from onetime events or transient adjustments in operating procedures that may or may not recur. This information will assist Market Participants and other stakeholders to make appropriately informed decisions.

The historic congestion information can be found on the NYISO website:

https://www.nyiso.com/ny-power-system-information-outlook (Congested Elements Reports)

Also, information on the NYISO's Economic Planning Studies can be found here:

https://www.nyiso.com/library (Planning Reports, Economic Planning Studies (CARIS))